SCIENCE-PRACTICE GAP: DOES INNOVATIVE ACADEMIC KNOWLEDGE DIFFUSE?

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To my parents: Thank you for setting the standard.

To my wife: Thank you for keeping the promise.

To my children: Keep your faith in all things you do.

To God: Thank you for the mercy and favor you have bestowed on my family and me.

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Abstract: It has been noted that few practitioners read academic research (Rynes, Colbert, & Brown, 2002). It has also been noted that the gap has grown so wide that science and practice are now specialized autonomous systems operating in isolation from each other (Siedl, 2005). Hambrick (1994) believes that science operates in such isolation that it is a closed loop. This closed loop presents challenges with science effectively communicating with practice (Kieser & Leiner, 2009). As most in the field recognize this as an issue (Hambrick, 1994; Siedl, 2005; Van De Ven, 2007; Kieser & Leiner, 2009) there seems to be a feeling among certain academics that the situation is simply the new norm of academic life (Siedl, 2005; Kieser & Leiner, 2009).

While I embrace the fact that the two systems have fundamental differences, this should not preclude some level of communication between the two. In fact, we know that some robust and rigorous scholarship is effectively communicated to practitioners. I hold that once we understand the anatomy of communicative scholarship, we can begin to close the gap more effectively.

By framing scholarship as an innovation (Rogers, 2010), I can investigate the underlying components, (i.e., relative advantage, compatibility, complexity, trialability, and observability) of academic research. With this framework, I will contrast the profiles of adopted research with non-adopted research. Subsequent to this, among the adopted research, I evaluate the impact of the components on the time and extent of diffusion.

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CHAPTER I

INTRODUCTION

Overview

Over 20 years ago, Hambrick (1994) decided to revisit an unresolved issue in the management field by stating: "It is time for us to break out of our closed loop. It is time for us to matter." In his presidential address to the Academy, Hambrick (1994) was eloquently referring to the "Science-Practice Gap," the notion that academic scholars are generating scientific knowledge that is not being implemented in practice. For example, in the field of management, scholars are producing scientific knowledge that is not being implemented by managers in practice.

The science-practice gap is not a phenomenon that plagues only the field of management. The gap is also a topic in medicine (Weller, 2004), nursing (Landers, 2000), psychology (Saxe, Cross, & Silverman, 1988), information technology (Harvey & Myers, 1995), accounting (Arnold & Hatzopoulos, 2000), economics (Trahan & Gitman, 1995), and chemistry (Sulpizi & Sprik, 2008). The gap is also referred to as the "theory-practice gap" (Weller, 2004), "research implementation gap" (Arlettaz, Schaub, Fournier, Reichlin, Sierro, Watson, & Braunisch, 2010), "science service gap" (Kelly, Somlai, DiFranceisco, Otto-Salaj, McAuliffe, Hackl, & Rompa, (2000), "scholarship practice gap" (Harvey & Myers, 1995), and simply "what we know and what we do" (Saxe et al., 1988). Ultimately, scholars who research the gap in various fields want to see evidence-based or scientific knowledge implemented into practice (Bero, Grilli, Grimshaw, Harvey, Oxman, & Thomson, 1998)., for the field of management, however, bridging the gap is exceptionally

important as the foundation and formation of the field was on the principle of being an applied science (Whitley, 1984). This dissertation looks to bridge the gap between science and practice by viewing the issue through the lens of diffusion of innovations theory.

To understand how the gap between science and research emerged, a basic understanding of the concept of knowledge is needed. Although Plato was credited with the first definition of "knowledge," the concept of "knowledge" predates him (Niiniluoto, Sintonen, & Wolenski, 2004). Plato defined knowledge (episteme) as a justified belief. He asserted a person *P* knows *k* if and only if *k* is true, *P* believes *k*, and *P* has adequate justification for believing *k* (Fine, 1984). However, not only did Plato's definition meet resistance, a group of scholars put forth skepticism, a notion that knowledge acquisition is simply not possible (Blackburn, 1996). This denial of knowledge acquisition will not be debated in this dissertation. Instead, I assume that knowledge can be acquired; but I also accept that there is an entire body of literature that will deny the possibility.

Although skepticism is not a focal point of this dissertation, its development did usher in the notion that there are different types of knowledge. Aristotle developed the theory of syllogism, a belief that knowledge was derived by building upon propositions and premises (Niiniluoto et al., 2004). Aristotle was credited with developing the field of logic (Burnyeat, 1996). However, it's Aristotle's scientific method (Niiniluoto et al., 2004), specifically scientific knowledge derived for the scientific method, that is a critical component that has contributed to the science-practice gap.

Although scientific knowledge is at the center of the scientific-practice gap, there are other contributing factors to the phenomenon. Scientific knowledge in academia is more than a discovery adhering to the standards of the scientific method; it must also endure the peer review process. Scientific knowledge that does not uphold the scientific method or endure the peer review process is dismissed as pseudo-knowledge (Niiniluoto et al., 2004). However, the knowledge that does meet both criteria is categorized as either applied or basic. Applied knowledge is created with the desire to obtain an explicit goal, whereas basic knowledge is created simply for the sake of knowing

(Niiniluoto, 2018). It is this distinction between applied and basic knowledge that is at the center of the science-practice gap.

In 1819, the world's first business school opened (Kaplan, 2014) as the value of applied knowledge grew worldwide (Roll-Hansen, 2017; Bud, 2012). Both theoretical and practical approaches to business education were part of the school's curriculum (Kaplan, 2014). However, the notion of introducing theoretical knowledge in the curriculum was met with great resistance (Lemercier, 2003), which was odd considering that most universities focused on the generation of basic knowledge (Roll-Hansen, 2017). Over 60 years after the world's first business school opened, the first business school opened in the U.S. with an emphasis on applied knowledge generation and teaching methods (Wren & Van Fleet, 1983).

As early as 1916, business schools were accused of lowering academic standards (Engwall & Zamagni, 1998). By 1930, business schools were thought to lack the rigor of empirical testing of business theories (Schlossman, Sedlak, & Wechsler, 1998). However, in 1936, the plight of business school education caught the attention of the Ford Foundation. The Ford Foundation added value to the medical field and looked to positively influence business schools as well. (Schlossman et al., 1998).

With the assistance of the Ford Foundation, the lack of rigor problem in business schools might have been over-corrected. By the 1960s the criticism was that business education was too centered on rigor and quantitative methods and less on the environments in which business operates (Bach, 1966). This seems to be the dawning of the science-practice gap, as the scientific method was thought by some to cause a dilemma in producing knowledge useful for practice (Campbell & Stanley, 1963). By 1978, the science-practice gap was termed a "crisis." Susman and Evered (1978) stated: "our research methods and techniques have become more sophisticated, they have also become increasingly less useful for solving the practical problems that members of organizations face." Since Campbell and Stanley recognized the science-practice gap, it has been an ongoing topic in academic journals,

conferences, and workshops (Li, 2010). Hambrick (1994) reinvigorated the topic in his 1993 Presidential address to the Academy of Management.

Theoretical Background

The management and entrepreneurship areas were formed and founded on the principle of being applied sciences (Whitley, 1984; Shane & Venkataraman, 2000). As these fields emerged, scholars created knowledge that was useful in practice in much the same way that a manufacturer looks to create products for its customers. However, as the fields matured, the science-practice gap emerged, impacting the rate of diffusion and adoption of academic knowledge by practitioners (Susman & Evered, 1978). Similar to how prior scholars used the basis of the Diffusion of Innovation Theory to understand the diffusion and adoption of products (Ryan & Gross, 1950), this dissertation will use the tenets of the theory to understand the diffusion and adoption of academic knowledge.

The Diffusion of Innovation Theory provides a theoretical framework to understand how innovations are diffused through and adopted by the members of a social system (Rogers, 2010). Innovations include technological and tangibile items such as iPhones, iPads, and iMac as well and intangible items like patents and copyrights (Aiken & Hage, 1971). The attributes of innovations impact rate of diffusion and adoption by members of a social system (Tornatzky & Klein, 1982). The rate of diffusion and adoption of innovations are also impacted by member characteristics (Rogers & Kincaid, 1981).

Statement of Purpose

Despite Hambrick's (1994) appeal to close the science-practice gap, some scholars have resisted. These critics suggest that science and practice are specialized systems which are autonomous and now operated in isolation from each other (Siedl, 2005). Kieser and Leiner (2009) suggested science and practice are two closed systems that are unable to communicate effectively. Essentially over time, the field of management has advanced into a sophisticated language, and academic researchers and practitioners have difficulty in finding "common ground" in the lay-expert communication dyad (Kieser & Leiner, 2009). Van de Ven and Johnson (2006) suggest that the lack of management

research relevance is due to a "knowledge transfer" problem, the inability to efficiently translate the academic language for practice. Similarly, Shapiro, Kirkman, & Courtney (2007) propose that the meaning of academic research is lost when translated into practice. On the surface, it appears that these critics have declared why the science-practice gap is unbridgeable. However, I posit that these critics have merely framed the problem. Roger's (1962) Diffusion of Innovation Theory provides a framework to view the problem through a different lens.

Rogers (1962) describes an innovation "as an idea, practice, or object that is perceived as new by an individual or other unit of adoption," a definition that fits scientific knowledge created by scholars. Diffusion is "the process by which an innovation is communicated through certain channels… to members of a social system" (Rogers, 2010). The rate of diffusion of an innovation is impacted by the characteristics of that innovation (Rogers, 1962). This study endeavors to determine whether the characteristics of academic knowledge impact the rate of diffusion from academia to practice. As such, the theoretical model (Figure 1) is as follows.

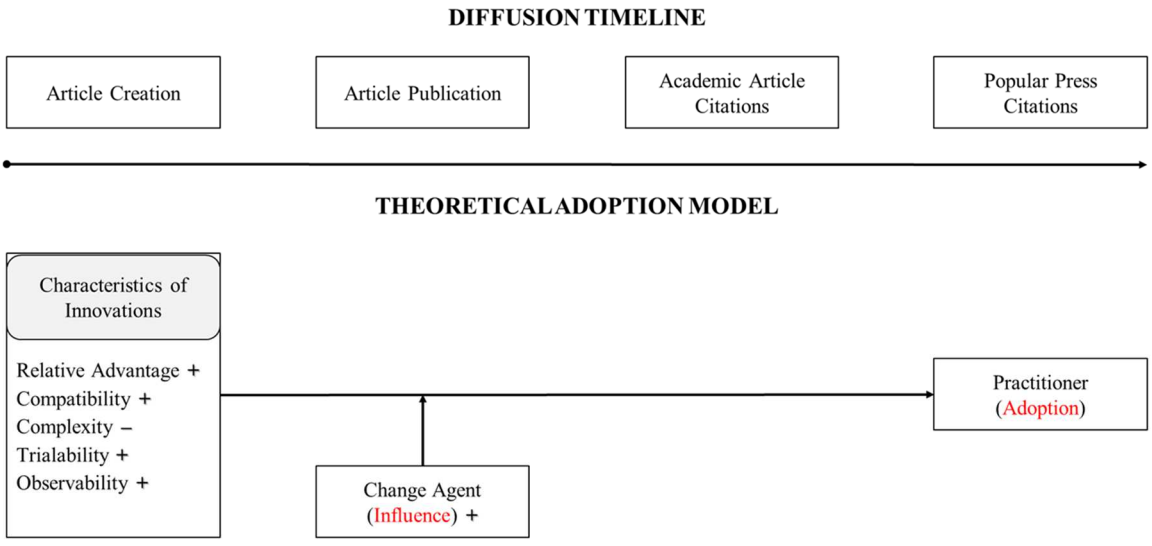

Figure 1. Theoretical Model

With this theoretical model, I posit that the characteristics of the innovation (relative advantage, compatibility, complexity, trialability, and observation) will be useful in predicting practitioner adoption. Precisely, as the relative advantage, compatibility, trialability, and observability of the innovation increase, the likelihood of practitioner adoption increases. However, as the complexity of the innovation increases, the likelihood of practitioner adoption decreases. Furthermore, as the change agent influence increases, the rate of adoption increases as well.

Problem Statement and Research Question

As an academic community, we know that practitioners are adopting some scientific knowledge. Authors of business-related books cite academic journal articles. This study utilizes these business-related books as a proxy for academic knowledge adopted by practitioners. Since research is reaching practitioners via popular press books, I posit that the attributes of academic knowledge dictate *what* research reaches practitioners. Popular press books have been used as a proxy to determine the impact of academic research on practice (Pfeffer & Fong, 2002). Additionally, in prior research, the popular press has been used to legitimize management theories and practices (Mazza & Alvarez, 2000). Prior research already provides insight into the attributes of manuscripts that are published in academic journals (Geuens, 2011). This research looks to build on that knowledge and explore what attributes or factors impact the adoption of academic knowledge by practitioners.

Presentation Format

This document combines both the dissertation proposal and the defense. Chapter I has been edited since the proposal and was originally presented without the Contributions of the Study section that is found at the end of this chapter. Along with the original Chapter I, Chapters II and III were included in the dissertation proposal. Chapters IV and V represent the dissertation defense. The next several paragraphs will outline the purpose of each chapter.

In order to define the construct, academic knowledge, Chapter II begins with a thorough discussion of epistemology and social epistemology. Chapter II also describes how the science-practice gap developed in the field of management and provides a thorough review of Diffusion of

Innovation (DOI) theory. Then spillover effect and systems theory will be married with DOI theory to create a theoretical model that explicates the properties of academic knowledge that are impacting practice. Finally, Chapter II will end by developing and presenting the hypotheses.

Chapter III outlines the hypotheses. To test the hypothesis, I first explore a random sample of popular press business books that have appeared on the *New York Times* Best Sellers list. During the investigation, I will prepare a list of academic articles (scientific knowledge) cited in the popular press books. Subsequently, I will code the innovation characteristic of each article. I will generate an additional list of non-adopted articles. I will derive a list of journals from the list of adopted academic articles. From the list of journals, I will include in the sample the balance of articles that were not adopted that appeared in the same issue. I will code the innovation characteristics of each non-adopted article. The dependent variable will be binary: 1 – adopted, 0 – not adopted. I will combine the two lists into one data set and perform logistic regression. Finally, I will use an analysis of variance (ANOVA) statistical technique to analyze each independent variable to determine whether a significant difference exists between the adopted versus not adopted attributes.

Additionally, I test the hypothesis by exploring a sample of articles in the Altmetric.com database. In general, altmetrics is defined as a way of determining the societal impact of academic research (Piwowar, 2013). In this study, I look to understand whether the diffusion of innovations characteristics determine the level of societal impact (practitioner adoption). In this test, I will code the diffusion of innovation characteristics for each selected article. The analysis uses the number of "Tweets" produced by members of the general public the target articles have accumulated as the dependent variable (practitioner adoption). By performing Poisson regression (as a result of using count data for the dependent variable), I will determine the level and impact of the covariates (diffusion attributes) on the dependent variables (practitioner adoption).

Contributions of the Study

Chapter IV details the results of the hypothesis testing. On the surface, the results of the two tests provide interesting results. Both tests provide favorable support for the hypothesis. However, the tests

do not provide consistent results for all the stated hypotheses. Although relative advantage measured by a calculation of citation count are found to be significant in both tests, their beta coefficients suggest that more exploration is needed.

Chapter V contains a discussion of the results, limitations, and contributions of the study. First, prior research argued that solving practical management problems with methodological rigor is unlikely (Susman & Evered, 1978). However, this study demonstrates that there is a possibility for academic knowledge to have both methodological rigor and an impact on practice as well. Additionally, this dissertation suggests that not all academic knowledge will have the same degree of impact on practice. Specifically, theory articles—academic knowledge derived without using empirics—have the least impact on practice. This supports the idea that there is a natural order to scientific discovery; the creation of applied knowledge should follow basic or theoretical knowledge (Huxley, 1881).

Additionally, Shapiro et al. (2007) propose that the meaning of scientific knowledge is lost in translation from science to practice. Likewise, the writing style of research is too sophisticated for practitioners (e.g., Leisenring & Johnson, 1994). The results of this dissertation did find support for the notion that the ideas of academic knowledge are lost in translation. However, it finds evidence counter to the claim that academic knowledge is too complicated for practitioners. Furthermore, the findings suggest that when practitioners read academic knowledge in its original format, there is a higher degree of impact on practitioner adoption than when academic knowledge is translated and transferred into popular press books.

A significant impact of this dissertation is expanding the boundaries of Diffusion of Innovation Theory. By marrying systems theory with spillover effect, I examine how innovations diffuse from one system to another. Past Diffusion of Innovation Theory research compared the diffusion and adoption of innovations between different systems, but those systems were homogenous, i.e., villagers (Rogers & Kincaid, 1981). This study investigates the diffusion of innovation across

heterogenous systems: science and practice. As such, Diffusion of Innovation Theory can predict the spillover effect of innovations across distinct systems.

Lastly, despite the widening gap, this study suggests that there is hope for bridging the science-practice gap. This should be a little unsettling for academics as it puts us on notice. For decades scholars have suggested that the science-practice gap is unbridgeable (Siedl, 2005; Shapiro et al., 2007; Kieser & Leiner, 2009). Academics argue predominantly that scientific knowledge is too sophisticated (Leisenring & Johnson, 1994) and rigorous to be useful for practitioners (Susman & Evered, 1978). Ultimately, this project suggests that the willingness to impact practice is a choice. This dissertation provides insight on the attributes of academic knowledge that impact practice. The findings also suggest that academic knowledge can be both sophisticated and rigorous and still impact practice.

More importantly, the findings of this dissertation provide the first steps in developing a measure of researchers' scholarly impact on practice. Currently, the h-index measures academic scholarly impact (Hirsch, 2005). Recently, the viability of the h-index has been questioned (Harzing & Van Der Wal, 2009). Remarkably, the h-index does not measure scholarly impact on practice. However, the measures used in this dissertation could be married with the h-index to create an enhanced h-index that calculates scholarly impact on practice.

CHAPTER II

REVIEW OF LITERATURE

Epistemology

Epistemology is "the branch of philosophy that studies the nature of knowledge, its presuppositions and foundations, and its extent and validity" (Devisch & Nyamnjoh, 2011). Ontology (metaphysics) and axiology (ethics and aesthetics) are the other branches of philosophy. Ontology investigates the nature of being, whereas axiology explores the value of things. Of the three branches of philosophy, epistemology is the youngest. However, the first record of epistemological problems is found in the sixth century BC. Yet the term "epistemology" was not coined until the nineteenth century (Niiniluoto et al., 2004). The field of epistemology is vast; as such, this literature review is focused upon the major developments in the field, particularly those that are critical to defining the construct "scientific knowledge."

The earliest discussion of epistemological catechism began with the conception of empiricism, the theory that all knowledge is derived from sense-experience. In the sixth century BC, Heraclitus put forth an epistemological challenge when he questioned whether Hesiod, Pythagoras, Xenophanes, and Hecataeus understood the information they accumulated. He stated that his preference was things when there is sight, hearing, and experience (Graham, 2007). Heraclitus valued knowledge derived from the senses rather than memory. Heraclitus' notion that knowledge is acquired by a sensory experience is similar to the contemporary concept of perception justification (Audi, 2010). Heraclitus' idea was further developed by Empedocles and Anaxagoras. Empedocles developed the concept of sense-cognition, the ability to perceive objects

in the mind. Anaxagoras developed the notion of reasoning, the ability to put two different perceptions together and derive new knowledge (Niiniluoto et al., 2004).

Democritus introduced the earliest forms of realism, the doctrine that even abstract knowledge concepts have an objective and absolute existence outside the mind. (Niiniluoto et al., 2004). During the same period, the fifth century BC, Protagoras was credited for introducing relativism, pragmatism, and skepticism concepts (Niiniluoto et al., 2004). Relativism is a doctrine that suggests that knowledge is relative to each person (Blackburn, 1996).

In comparison to relativism, pragmatism has an additional condition—it allows for knowledge to be relative to each person, but it must connect to the real world (Blackburn, 1996). Although Protagoras provided a framework on how knowledge can be acquired, he was also the first to introduce concepts of skepticism (Niiniluoto et al., 2004). Proponents of skepticism deny that knowledge or rational belief is possible (Blackburn, 1996). However, skepticism theory did not fully develop until the latter part of the fourth century BC (Niiniluoto et al., 2004). Like skepticism, most epistemological catechisms were nascent until Plato asserted the first definition of knowledge.

In the fifth century BC, Plato provided the first definition of knowledge (*episteme*) as a true justified belief (Niiniluoto et al., 2004). Plato asserted a person *P* knows *k* if and only if *k* is true, *P* believes *k*, and *P* has adequate justification for believing *k* (Fine, 1984). If a person failed to have all the components of the definition, the person would merely have an opinion (*doxa*) (Niiniluoto et al., 2004). Plato further dichotomized knowledge into intuitive (*noesis*) and discursive (*dianoia*). Plato's intuitive knowledge is different than knowledge acquired through the senses, experiences, or reasoning. Intuitive knowledge is derived from a person's innate ability (Niiniluoto et al., 2004). The classic example is when Plato describes a slave boy who knew of geometrical principles without being exposed to geometry (Klein, 1989). Discursive knowledge is derived from mathematical computations. Plato found discursive knowledge inferior to intuitive knowledge (Niiniluoto et al., 2004).

Although Empedocles, Anaxagoras, and Heraclitus are credited with introducing the notion that knowledge is derived from sensing and reasoning, Plato framed the rationalism doctrine. In general, rationalism is the belief that knowledge acquisition and justification is derived from sensing and reasoning that is unaided by some prior experience (Blackburn, 1996). Plato made a further distinction between methodological rationalism (*apriorism*), knowledge derived by cognition (sensing and reasoning), and genetic rationalism (nativism), inborn knowledge. Plato suggested that *apriorism* is valuable and nativism was not (Niiniluoto et al., 2004). However, Aristotle dismissed both *apriorism* and nativism—the idea that knowledge can be acquired without prior experience (Blackburn, 1996)—as defined by his teacher, Plato.

Aristotle put forth that knowledge starts with a sensory experience with a particular subject. For Aristotle, the slave boy in the cave did not just know geometry *a priori*; he pieced it together by connecting smaller geometric concepts into larger geometric concepts. As such, the slave boy knew geometry *a posteriori*: by building on prior knowledge, the slave boy was able to make discoveries. Again, skeptics would question whether the slave boy knew the first geometric concept to piece together with the second geometric concept to know geometry. Both Aristotle's *a posteriori* belief of knowledge and the developing skepticism theories mark a critical point in epistemology history. First, I will address skepticism.

As noted, skepticism is the denial that knowledge acquisition is possible (Blackburn, 1996). Post-Aristotle and until the first century BC, skepticism and new debates on ethics dominated epistemological discussions (Niiniluoto et al., 2004). Although the Epicureans, Stoics, and Skeptics added to skepticism theory, Aenesidemus is credited for introducing the ten tropes: the reasons why direct knowledge was not possible (Niiniluoto et al., 2004). Still today philosophers are debating the definition of knowledge and whether humans truly can know something (Audi, 2010). This will not be debated in this dissertation. Instead, I assume that knowledge can be acquired, but I also accept that there is an entire body of literature that will deny the possibility.

Returning to Aristotle's *a posteriori* belief of knowledge: *a posteriori* knowledge is derived from using a combination of prior experience-based information and reasoning to develop new knowledge. This act of building knowledge from a chain of logical deduction is known as a syllogism (Niiniluoto et al., 2004). For example, All horses have tails; all things with tails are four-legged; so all horses are four-legged (Blackburn, 1996). Both of the initial statements, "all horses have tails" and "all things with tails are four-legged," were defined as propositions or premises. The concluding statement, "so all horses are four-legged," is the deduction of a conclusion. In conjunction with developing the theory of syllogism, Aristotle is also credited with developing the independent science of logic (Burnyeat, 1996). However, it is Aristotle's scientific method that dominated the epistemology literature until the Renaissance (Niiniluoto et al., 2004). The popularity of the scientific method was influenced by Euclid's and Ptolemy's books *Elements* and *Almagest*, respectively. These works reinforced the notion that knowledge can be derived from the scientific method (Niiniluoto et al., 2004). It is this notion of *a posteriori* knowledge derived for the scientific method that defines this project's construct, scientific knowledge.

Although the notion of scientific knowledge stayed relevant for centuries, the Middle Ages brought on different philosophical debates. During this period, scholars looked to determine the connection between philosophy and theology (Niiniluoto et al., 2004). In the fifth century, Dionysius introduced a mystical stance on knowledge, the belief that knowledge is derived from having a connection with God. He posited human capabilities were too restrictive and needed God's intervention to produce knowledge (Niiniluoto et al., 2004). Later Averroes, the Commentator, suggested that the study of philosophy was greater than theology. However, Siger of Brabant suggested the theory of double truth, whereby there are theological and philosophical truths and both are distinct epistemological divisions that are not in conflict with each other (Niiniluoto et al., 2004). Regarding scientific knowledge during the Middle Ages, Roger Bacon further developed the distinction between philosophy and theology and proposed empiricistic epistemology, which is based on experiment and mathematics. William of Ockham and his followers defended the notion of

separating philosophy and theology and helped usher in a new era of scientific methodology that relied on experience and mathematics that continued into the fourteenth century (Niiniluoto et al., 2004).

As time transitioned from the Middle Ages to the Renaissance era, Descartes' and Kant's philosophy dominated the period. Descartes, who discovered analytic geometry, demanded a systematic methodology when investigating philosophy. As such, he introduced methodological skepticism to challenge skepticism (Niiniluoto et al., 2004). Kant, on the other hand, disliked both rationalism and empiricism theories and looked to synthesize both in a new theory of knowledge. In his quest, he further developed Aristotle's proposition or premise statements into two divisions—analytic and synthetic. If the premise 'S is P' and concept P is contained in concept S, then the premise is analytic. For example, the statement "All bachelors are unmarried" is true by definition, an example is the most basic syllogism (logic).

On the other hand; if concept P exceeds the content of S, then the premise is synthetic. For example, the statement "snow is white" is true because of what it means to have the characteristics of snow and the color of snow is white. However, knowing snow is white requires prior knowledge of the characteristics of snow and the color white, and this knowledge is like knowledge derived in mathematics. Therefore, Kant used the distinction between analytic and synthetic knowledge to define the difference between logic and mathematics. Subsequently, the study of epistemology divides into the subcategories of logic and mathematics (Niiniluoto et al., 2004).

In typical epistemological fashion, Descartes' and Kant's theories were debated, redeveloped, and criticized by future scholars. However, in the nineteenth century, in an attempt to provide clarity to epistemology concerns, August Comte proposed a division of epistemology thought. He declared three divisions: 1) religion as knowledge based on myths; 2) metaphysical knowledge based on speculation; and 3) positivism, knowledge based on science (Niiniluoto et al., 2004). His notion of knowledge based on science led to the positivism movement. With the help of philosophers such as John Stuart Mill, Bernard Bolzano, and Rudolf Carnap, positivism became a reoccurring

epistemological theme well into the twentieth century. Carnap further developed Kant's analytic and synthetic dichotomy, but more importantly introduced logical positivism (Carnap & Jeffrey, 1971). Logical positivism is the doctrine that puts forth the verification principle (verificationism) that only empirically verifiable statements are meaningful. Otherwise, they are tautological (Blackburn, 1996).

Later Willard Van Orman Quine challenged both the analytic and synthetic dichotomy as well as verificationism (Van Orman Quine, 1976). Van Orman Quine applied logical tools such as "if-then" statements into the study of epistemology (Niiniluoto et al., 2004) For example, if all squares are rectangles and all rectangles have four sides, then all squares have four sides. Van Orman Quine disregarded skepticism. As such Van Orman Quine is known as the founder of naturalized epistemology, the study of knowledge formation by humans without taking into account skepticism (Blackburn, 1996). Despite Van Orman Quine's efforts to challenge logical positivism, it was redeveloped as logical empiricism by Karl Raimund Popper and the members of the Vienna Circle (Niiniluoto et al., 2004). Popper introduced the falsifiability principle, similar to the verification principle, which held that a scientific statement must be positioned to be proven wrong (Fuller, 2003).

Popper's falsifiability principle revitalized logical positivism as logical empiricism. This new belief of logical empiricism was the formation of the philosophy of science. Popper's falsifiability principle made a distinction between science and pseudo-science (Fuller, 2003). To be real science, the fallibility principle was required. This subdivision of epistemology allowed philosophers of science to investigate knowledge acquisition differently than traditional epistemologist (Niiniluoto et al., 2004). They could now investigate theoretical, observational, experimental, and model-based knowledge without the skepticism challenges, which deny the possibility of knowledge acquisition.

Theoretically based knowledge is derived by using an axiom-based system. Within an axiom-based system, a set of basic postulates are used to develop additional theoretical claims or knowledge (Niiniluoto et al., 2004). Observational-based knowledge is derived from the human sensory experience, including sensory experiences enhanced by scientific tools, i.e., microscopes or scales. Experimental-based knowledge adds manipulation to observations techniques. Models assist in

knowledge acquisition by adding an intermediary between abstract theory and concrete data (Niiniluoto et al., 2004). It is this type of knowledge, derived from these contemporary scientific methods that are the subject of this project. However, knowledge derived from contemporary methods still does not provide the full picture of the human epistemic situation.

Social Epistemology

Traditional epistemology has an individualistic focus, evaluating the justified beliefs of an individual. However, the human experience (including acquiring knowledge) is impacted by social relationships within social systems. Therefore, the individualistic knowledge focus of traditional epistemology is an incomplete view of knowledge acquisition. Social epistemology is the branch of epistemology that investigates the effects of social interactions and social systems on epistemic principles (Goldman & Blanchard, 2018). Social epistemology is investigated in three subdivisions.

The first subdivision of social epistemology assesses the quality of individuals' beliefs based on another person's testimony. In this setting, the epistemic focus is on testimony-based justification and peer disagreement. The second subdivision focuses on the quality group beliefs and justifications. Both of the first two subdivisions introduce and debate group-level skepticism. Like individual-level skepticism, group-level skepticism will not be debated in this dissertation. Instead, I assume that group-level knowledge can be acquired. However, I also accept that there is an entire body of literature that will deny the possibility. As such, I redirect to the last subdivision of social epistemology.

The last subdivision of social epistemology is the area of focus for this study. This subdivision investigates how certain institutional decisions or systemic relations are adopted as opposed to alternatives (Goldman & Blanchard, 2018). As part of my focus, I explore the brief history of the last subdivision of social epistemology and end by highlighting how scientific knowledge is diffused through and adopted by members of the scientific community. A "scientific community" is a group of investigators who jointly produce scientific knowledge within a subject matter (Niiniluoto, 2018). Before the 1960s the notion of a scientific community holding beliefs was vague at best. Although

Francis Bacon shared his vision of science as a cooperative activity in his publication, *The New Atlantis* (1662) (Niiniluoto, 2018), there was little concern about social norms and arrangements governing scientific activity (Goldman & Blanchard, 2018). However, Kuhn's publication, *The Structure of Scientific Revolutions* (1962), introduced the notion that science was missing the social point of view. Kuhn (1962) suggests that current paradigms influence the beliefs and practices of researchers in a scientific community. Kuhn (1962) describes a paradigm as an unprecedented scientific achievement that establishes a community of followers and opens up the possibility of additional research questions to be resolved. For example, before the paradigm that established the sun as the center of the universe, Aristotle and Ptolemy's study of planetary motion held the earth as the center of the universe (Evans, 1998). However, Copernicus later established heliocentrism, the belief that the sun is the center of the universe, rather than the earth (Evans, 1998). This new belief was not only a shift from the old paradigm, but ushered a new paradigm where researchers started extending the new theory of planetary motion. For example, Kepler extended on Copernicus new paradigm. Kepler suggested that planets traveled in an elliptical path rather than circular as previously believed (Evans, 1998). Without Copernicus' discovery, it is debatable whether Kepler would have produced his theories of scientific motion. What is not debatable is that the new paradigm influenced Kepler.

This simple historical account of the theoretical change in the study of planetary motion fails to paint the entire evolution of a paradigm shift. For one thing, this simple historical example suggests paradigm shifts occurs in an amicable fashion; and another; it characterizes the shift as an either-or proposition. First, I address point number one. Paradigm shifts are often met with considerable opposition. Galileo Galilei was put on trial for his publication, *Sidereus Nuncius* (1610), which supported the heliocentric view of the universe (Langford, 1992). It is a result of these diverging views that Kuhn (1962) suggested that death and time are the two most influential forces that usher in paradigm shifts. Although the death of the scholar whose discovery would influence a new paradigm would stop the shift, Kuhn (1962) was referring to the death of the last scholar holding on to the old

paradigm. The resistance to the new paradigm dies with the death of the last scholar supporting the old paradigm. However, this, of course, assumes that the new paradigm has a scientific grounding that surviving scholars would support. Although death will assist with a paradigm shift, the element of time provides a more natural explanation of a paradigm shift within a scientific community.

The element of time works as follows within a scientific community. Imagine a group of students at the beginning of their scholarly journey. They are exposed to the set of current scientific paradigms via textbooks, lectures, and observations. As they progress along their academic journey, they begin to develop their research. In typical fashion, they build their research upon the set of paradigms they have absorbed along the way. However, a scientific discovery is made, perhaps by one of their peers. Let's say this newer discovery is counter to the current paradigm. The newer discovery may be deemed as disruptive force or a much-needed shift. Then a new group of students now embarks on their academic journey; they will be exposed to both the old and new paradigms via new textbooks, lectures, and observations. The newer discoveries made between the start of the first and second groups appear less like disruptive forces, particularly if they better explain unanswered research questions, i.e., Copernicus's theory of planetary motion. If the discovery is good scientific knowledge, despite any initial resistance, it will gain the approval of the scientific community and be cemented as the new paradigm (Kuhn, 1962). Thus time acts as an agent that provides legitimacy for newer scientific discovery and silently ushers in new paradigms, particularly for newer scholars.

As for point number two above, a paradigm shift is not always an either-or proposition, i.e., Aristotle and Ptolemy versus Copernicus' theory of planetary motion. As I chronicled the history of epistemology, I found that paradigms shift to a new belief and years later reverted to the old. As in the case of scientific knowledge, we saw the philosophy of science break away from epistemology to allow for the study of knowledge without the challenges of skepticism (Niiniluoto et al., 2004). Although the philosophy of science was a new paradigm knowledge, it is still connected to epistemology. So from a macro level, scholars researching either the philosophy of science or epistemology were members of the same scientific community. On a micro level, the philosophy of

science and epistemology are viewed as different scientific communities. Later, this study will reveal that the macro-micro distinction is most important when a new field of study is formed.

A new paradigm can alter the course of a field of study, i.e., the study of planetary motion, or help create a new field of study, i.e., the philosophy of science. The former disrupts the foundational elements of a field of study while the latter creates a new field of study with a new set of foundational principles. In the case where the paradigm shift changes the foundational element of the field of study, on a macro level, the research community is intact. The researchers have additional tools to build new theories. However, in the case where the paradigm shift causes the development of a new field of interest, scholars may fall out of the research community, mainly if the new field is a pseudo-science, i.e., astrology or Scientology (Niiniluoto, 2018).

Determining the distinction between science and pseudo-science is known as the "demarcation problem" (Niiniluoto, 1984). Science requires a rigorous methodological approach, and scientific knowledge builds on falsifiable hypotheses (Fuller, 2003). Francis Bacon desired a universal method for the generation and assessment of new knowledge (Spier, 2002). However, from a social epistemological viewpoint, a scientific field is more than a set of standards. Science is considered a study of knowledge where universal agreement can be obtained (Campbell, 1952). Although the scientific knowledge of Copernicus was reviewed by the church (and subsequently led to his imprisonment), the notion of other scholarly peers reviewing and validating occurred over a hundred years after Copernicus's death (Spier, 2002).

In was Francis Bacon's *Novum Organum* (1620) that inspired a group of English scholars to meet to discuss and debate their varying opinions on emerging scientific ideas (Spier, 2002). In 1662, the group of scholars formed an official academy that later became the Royal Society of London. The goal of the academy was to improve on the standards for deriving scientific knowledge (Spier, 2002). By 1665, the group produced a journal, *Philosophical Transactions*. Initially, materials published in the journal were subjected only to the review of the editor, Henry Oldenburg. However, as the Society and journal evolved over the next 100-plus years, subject-matter experts would influence the editor's

comments on manuscripts. The ultimate goal of the editor and subject-matter experts was to affirm new and reject old paradigms (Dear, 1985).

Over the next three centuries, the number of journals producing scientific knowledge increased exponentially, leading to a lack of scientific knowledge to fill the journals (Spier, 2002). Meanwhile, the peer-review process was slowly evolving from its roots. It took until the 1750s before the widespread use of a double-blind review process was implemented by prominent journals (Spier, 2002). However, by the 1950s, the peer-review system was the scientific community's established and acceptable means to judge the quality of new scientific knowledge (Niiniluoto, 2018). The commercial availability of photocopiers in the late 1950s helped cement the peer-review process. The photocopier increased the number of manuscripts submitted to journals, thereby increasing the discriminating procedures of journal editors. As a result, the photocopier not only led to an increase in the number of manuscripts submitted, but increased quality as well (Spier, 2002). Robert K. Merton (1973) argues that the quality of scientific knowledge is a result of the scientific community accepting the discriminating ability of the peer-review process. This scientific knowledge has endured the rigorous process of peer-review that is the subject of the project.

Science-Practice Gap

While the peer-review process was developing into the formal method to acknowledge scientific knowledge, another knowledge distinction was gaining the attention of scholars (Kitcher, 2004). Knowledge was being categorized as "applied" or "basic." By definition, applied knowledge is created with the desire of obtaining an explicit goal (Niiniluoto, 2018). Applied knowledge is distinct, from basic or pure knowledge. The notion of applied knowledge is not a contemporary concept. Aristotle introduced the notion of applied knowledge, a discovery with a "final cause" or intended use (Niiniluoto, 2018). In the early seventheenth century, Francis Bacon suggested that knowledge should assist in producing the desired results or preventing unwelcomed outcomes (Roll-Hansen, 2017). By the eighteenth century, the distinction between applied and basic knowledge had a significant impact on the scientific community (Kitcher, 2004).

Historically, universities- knowledge-creation process focused on basic knowledge (Roll-Hansen, 2017). However, by the eighteenth century, there was a rise in the practical implications of chemistry in agriculture. As such, the field of chemistry was one of the first scientific communities to teach both basic and applied knowledge concepts (Meinel, 1985). This change by the field of chemistry revolutionized the perceptions of applied knowledge. During the London Great Exhibition of 1851, the social benefits of applied science were being celebrated, which assisted in legitimating the spending of public funds on science (Roll-Hansen, 2017). There was thus an increase in public support for both basic and applied education (Bud, 2012). However, by the late nineteenth century, support for applied knowledge outweighed basic, such that scholars found it necessary to remind the general public of the need for pure knowledge (Roll-Hansen, 2017). The desire for applied over basic knowledge was so great that Huxley (1881) stated that he wished the phrase "applied science" was never invented. Huxley believed science was a unity between basic and applied. He believed the natural order of discovery was basic and then applied knowledge (Huxley, 1881).

As a result of the popularity of applied science, the nineteenth century ushered in the world's first business school. In 1819, a trader, Vital Roux, and an economist, Jean-Baptiste Say, cofounded Ecole Supérieure de Commerce de Paris (ESCP Europe) in Paris, France (Kaplan, 2014). In a move that would have pleased Huxley, the school's curriculum used both theoretical and practical approaches to business education. However, the move to include theoretical approaches in the curriculum was met with such resistance by the Paris Chamber of Commerce; the chamber refused to sponsor a funding request by the school (Lemercier, 2003). The resistance to theoretical business concepts was odd, considering most universities focused on basic knowledge (Roll-Hansen, 2017). However, the resistance to the theoretical curriculum at ESCP Europe and the other business schools opening throughout France and Belgium was due to the widespread belief that management skills could only be learned in practice (Kieser, 2004).

Where there was a resistance to a theoretical curriculum approach in France, Germany fully embraced the notion of a theoretical field of business. In 1898, Handelshochschule Leipzig, the first

German business school, opened. By this time, Germany's educational system was profoundly influenced by Alexander von Humboldt, a proponent of Romantic philosophy and science (Kaplan, 2014). The Humboldtian model of education suggests students acquire a holistic understanding of discipline only through scientific research (Sam & Van Der Sijde, 2014). The influence of the Humboldtian model on Germany's business schools led to the emergence of the science of the business administration field (Kaplan, 2014). Eugen Schmalenbach, a prominent academic and economist, believed a school's objective was to maximize the welfare of the community it served rather than generating profits. With this claim and by using his academic influence, Schmalenbach encouraged schools to recognize management as an academic discipline (Kieser, 2004). As a result of the impact of both Humboldt and Schmalenbach, by the mid-1910s most German schools abandoned the practice-oriented philosophy and adopted a highly academic approach to business education (Üsdiken, 2004).

Where Germany's business schools were influenced by Humboldt and Schmalenbach, the first U.S. business schools were influenced by Fredrick Taylor, the "father" of the scientific management and efficiency movement (Kaplan, 2014). In 1881, the Wharton School of Finance and Commerce was opened by industrialist Joseph Wharton. The school's guiding principles centered on the improvement of economic efficiency (Wren & Van Fleet, 1983). In 1898, the Haas School of Business was established as the College of Commerce of the University of California. Additional business schools soon followed in Illinois, New York, and Wisconsin (Wheelen & Hunger, 1975). Like their European counterparts, U.S. business schools were not well received (Kaplan, 2014). Even in 1916, as a group of prominent business schools initiated the founding of the Association to Advance Collegiate Schools of Business (AACSB), an organization with goals of accrediting and standardizing business school education, business schools were accused of lowering academic standards (Engwall & Zamagni, 1998).

However, the most critical attack on U.S. business schools came in 1930 by Abraham Flexner, an American educator (Schlossman et al., 1998). In his book *Universities: American, English, German*

(1930), Flexner stated that business schools lack the rigor of empirical testing of business theories. He further equated business education as vocational schools that should not have a place in prestigious universities like Columbia, Harvard, and the University of Chicago. By 1936, the plight of business education caught the attention of the Ford Foundation. Shortly after that, the Ford Foundation ventured into investigation of business education. This move was not unexpected as the Ford Foundation was instrumental in reforming American medical education in the early 1900s (Schlossman et al., 1998).

The Ford Foundation's initial report on business schools was unfavorable. The report suggested that the knowledge generated by the schools were narrowly focused, unscientific, and ungeneralizable. The report further suggested there were few attempts by business schools to tie education to any scientific material. The Ford Foundation too reported business education was vocational in its teaching. However, the teaching techniques did assist students in securing entry-level jobs. The lack of emphasis on research-based teaching was attributed to the practitioner background of most of the business education instructors. As a result of his findings, Wyman Fiske, the author of the report, concluded that the field needed academic rigor and that the foundation should intervene (Schlossman et al., 1998).

The Ford Foundation did intervene and in 1953 developed an agenda to assist in reforming business education. The Foundation would financially support a limited number of graduate-level university centers that would focus on problem-oriented integrated research, graduate training in economics and administration, and a fellowship program to encourage a higher quality of students. By 1954, the Foundation began funding graduate centers (Schlossman et al., 1998).

The Ford Foundations' impact on business education was consequential, and their involvement was the beginning of the research-practitioner gap. By 1966, The Ford Foundation had spent $35 million on business education reform. In a short span of 10 years (1955 to 1965), the number of colleges offering business classes increased by 33%, and the number of AACSB member schools increased by 46%. Perhaps the most significant result was a change in quantitative requirements by

business schools. The minimum math requirements for business programs increased from algebra to calculus for prestigious schools like Harvard and MIT (Schlossman et al., 1998). More importantly, there was a sense that the business field was on par with other professions such that its practice relied upon the application of a body of scientific knowledge (Gordon & Howell, 1959). However, there was criticism that business education was too centered on rigor and quantitative methods and less on the environment in which business operates (Bach, 1966).

As early as 1963, Donald Campbell and Julian Stanley recognized that the scientific methods created a dilemma in producing knowledge useful for practice. As a result of this concern, they suggested a quasi-experimental method to bridge the gap (Campbell & Stanley, 1963). By 1978, the science-practice gap was termed a "crisis." Susman and Evered (1978) stated that research methods and techniques became more sophisticated but increasingly less useful for solving the practical problems that business practitioners face. They suggested action research as a method to bridge the gap. Since Campbell and Stanley recognized the science-practice gap, it has been an ongoing topic in academic journals, conferences, and workshops (Li, 2010).

Over the last 50-plus years, the critiques of scientific knowledge as it pertains to practice has been categorized into four general areas: 1) academic knowledge lacks impact on practice (e.g., Susman & Evered, 1978; Rynes, Bartunek, & Daft, 2001); 2) academic knowledge is too theoretical and therefore too irrelevant for practice (e.g., Ivory, Miskell, Shipton, & White, 2006); 3) academic research questions are too narrow or unimportant to those making business decisions (e.g., Starkey & Madan, 2001); and 4) the writing style of research is too sophisticated (e.g., Leisenring & Johnson, 1994). Many suggest that there is little hope in shifting the current academic knowledge paradigm.

Researchers suggest "knowledge transfer," the inability to efficiently translate academic language for practitioners (Van de Ven & Johnson, 2006), as a cause for lack of scientific knowledge impact on practice. Shapiro and colleagues (2007) propose that the meaning of scientific knowledge is lost in translation from science to practice. Another scholar suggests that both scientists and practitioners are seen as experts in their respective domains but are considered laymen to each other. So, the science-

practitioner gap arises from their difficulty in finding "common ground" in the layman-expert communication dyad (Kieser & Leiner, 2009). Van de Ven (2002) summarizes the science-practice gap as complex.

However, more important than the critique of scientific knowledge is understanding how to bridge the gap. In this dissertation, Diffusion of Innovations Theory is enhanced by Systems Theory and the spillover effect to create a model that predicts the adoption of academic knowledge by practice.

Diffusion of Innovation

Scientific knowledge created by an academic scholar is an innovation (Rogers, 2010). Moreover, it is not simply an innovation; it is a creation that can disrupt an academic paradigm or impact practice (Kuhn, 1962). The magnitude of the disruption is contingent on the innovativeness of that knowledge. Academic knowledge has consistently been informing practice even with the widening gap between science and practice. In the nineteenth century, Louis Pasteur developed germ theory, which led to the practice of pasteurization (Pasteur, Joubert, & Chamberland, 1878). More recently, in the twenty-first century, the used of statistical analysis techniques have been put into practice to evaluate player talent in professional sports (Fry & Ohlmann, 2012). In the field of management, science has also impacted practice. For example, agency theory is the basis for the compensation packages awarded to executives as a means of mitigating information asymmetry between principal and agent (e.g., Eisenhardt, 1989). However, the total impact science has on practice is less than desired by scholars (Hambrick, 1994; Van de Ven, 2002).

Despite the widening gap, there is hope that the science-practice gap is bridgeable. To illustrate, if we take a simple search of various bestsellers lists, the result will be a multitude of books on business-related topics. Upon closer inspection, some authors of these business-related books cite academic journal articles and scholarly books. Since there is at least some research reaching practitioners via popular press books, I posit that there are attributes of academic knowledge that dictate what research reaches practitioners. Prior research has already provided insight into the

attributes of manuscripts that are published in academic journals (Geuens, 2011). Pfeffer and Fong (2002) recommend that future research focus on operationalizing the influence of diffusion and language to understand the impacts of science on practice. This research looks to build on Geuens' (2011) knowledge and accept the Pfeffer and Fong (2002) challenge to explore the factors that impact the diffusion and adoption of academic knowledge by practice.

Formally, diffusion is a process by which an innovation is communicated over time among members of a social system (Rogers, 2010). An innovation is an idea that is perceived as new by some individual or group (Rogers, 1962). The communication channels through which the innovation flows ranges from impersonal channels, such as television commercials, to interpersonal word of mouth communications (Turnbull & Meenaghan, 1980). The diffusion and adoption of an innovation is communication through a social system, like farmers (Ryan & Gross, 1950), villagers (Wellin, 1955), tribes (Sharp, 1952), and school districts (Mort, 1953). This dissertation seeks to expand the boundaries of DOI theory by broadening the definition of innovation as well as enlarging the types of communication channels. As this study explores the components of DOI theory (innovation, time, communication channel, and social system), the spillover effect and systems theory will be married with DOI to create a theoretical model that explicates the properties of academic knowledge that are impacting practice.

Innovations

In the initial studies of DOI, innovations were limited to tangible products (i.e., hybrid corn seeds). The characteristics of innovations expanded to include intangible items like procedures, services, and ideas (Aiken & Hage, 1971). As a result of expanding boundaries, innovations are now multidimensional. New innovations can take the form of something radically different than any previous innovation or they may be incremental changes to an existing innovation (Damanpour, 1988). For example, the iPhone would be considered a radical innovation. Thus the original iPhone was revolutionary as it combined numerous existing technologies into one device in a novel stylistic

way, whereas the periodic software updates that add functionally to the iPhone are incremental innovations. Similarly, Evan (1966) categorizes innovations as technical or administrative.

Technical innovations are not simply technological innovations or innovations derived from technology. Technical innovations are characterized as innovations that are directly related to the primary activity of the system. So, academic knowledge would be characterized as a technical innovation as directly related to the primary activity of a scholarly researcher. On the other hand, administrative innovations are described as innovations that have an impact on the system (Damanpour & Evan, 1984). So, when scholarly researchers publish academic articles, they have created a technical innovation. However, when an executive reads the article and implements an organizational change, the resulting change to the organization would be an administrative innovation.

Innovations are not necessarily fixed packages (Lyytinen & Damsgaard, 2001). When the significance of an innovation (i.e., academic article) changes from one context to the next, the innovation has interpretive flexibility. An innovation is a "boundary object"—more than the sum of its parts (Leigh Star, 2010). As such, an innovation may have different administrative impacts based on the adopter's needs and desires. For example, one family may adopt the latest television solely for the purpose of increasing their visual and auditory entertainment value; whereas another family may adopt the same television for the same reasons as the first plus the added value of the packaging. The box provides additional entertainment for the children. Therefore, the true use and interpretation of adopted innovation depends on the adopter (Star & Griesemer, 1989). Innovations that have interpretative flexibility appeal to a wider audience and are more likely to be adopted (Berger, Draganska, & Simonson, 2007).

Time and the Communication Channel

From Kuhn (1962) we understand that as time passes even the adoption of radical innovations are more likely to occur. The focus of this dissertation is less on how time impacts the diffusion and adoption of academic knowledge and more on the attributes of that adapted knowledge. However, to

fully explicate DOI, the time component must be included. This is because time is interrelated with communication. The time it takes for a system to adopt an innovation is impacted by the communication channel between the creator and the adopting unit. Before an adoption decision is made, the adoption system must be knowledgeable about the innovation and persuaded by the innovation features (Venkatraman, 1989). Knowledge and persuasion are an integral part of the communication channel, and each of the components will be explored next.

Knowledge

To have knowledge or awareness of an innovation, an individual or adoption system must be exposed to the innovation. Exposure comes in the form of horizontal or vertical communication channels. Exposure from a horizontal communication channel occurs when an individual gains knowledge about an innovation from a friend or associate. Horizontal communication flows among members of a system who have something in common (Turnbull & Meenaghan, 1980). Having something in common is the connection point that provides an opportunity for information to flow. When two individuals are horizontally connected, one of the two may have more influence and act as an opinion leader.

Opinion leaders are members of the social system who exert their influence on their followers within the social system. Depending on the social system and innovation, the opinion leader can be a proponent or opponent of the innovation (Venkatraman, 1989). Regardless of their thoughts on an innovation, opinion leaders typically have more mass-media exposure and a higher degree of innovativeness when compared to other members of the system (Rogers & van Es, 1964).

An opinion leader serves a role in a vertical communication channel by familiarizing two unconnected systems. A vertical communication channel is one in which there is no expectation of communication between two individuals, systems, or units (Turnbull & Meenaghan, 1980). A manufacturer of an innovation and an unaware consumer is an example of a vertical communication channel. In a two-step communication model, the unaware consumer becomes aware of the

innovation by an opinion leader or a change agent. Unlike opinion leaders, change agents are not members of the adopting system and are external influencers (Choi, 2015).

The impact of the change agent is often a focal aspect of communication channel research. A change agent is an individual who advocates for the adoption of an innovation (Hoffmann, Probst, & Christinck, 2007). Although change agents may have similar attributes when compared to opinion leaders, they are different (Rogers & van Es, 1964). An opinion leader is a member of the social system and may be a proponent or opponent of the innovation. Change agents, on the other hand, are external to the social system and advocate for the innovation (Rogers & Kincaid, 1981). They seek to change the status quo (Ottaway, 1983) and reduce innovation uncertainty (Turnbull & Meenaghan, 1980). However, change agents are not always individuals who work for the innovation's creator (Ottaway, 1983). Change agents act as a passive influence on adoptions decisions as well (Turnbull & Meenaghan, 1980). Branding or an association with a group are forms of passive change agent influence (Gad & Nicholas, 2003). For example, an individual in the market for a pair of sneakers may choose a pair of Nikes' over a pair of Adidas due to Nike's association with Michael Jordan.

Spillover Effect

However, if the adoption unit is not actively seeking the innovation, awareness may occur by accident (Rogers, 2010). This unintended awareness or knowledge of an innovation is characterized as a spillover effect (Griliches, 1979). The knowledge spillover effect often occurs when random people are forced upon each other. For example, one asks the Lyft driver whether shuttling around people is his full-time job. He replies with "no," but goes past the ritualistic pleasantries and provides an unprompted 60-minute lecture on the honey-producing habits of the African honeybee. Learning about the African honeybee was spillover knowledge as it was unintended. Spillover effects occur with innovations as well.

Audretsch and Keilbach (2007) suggest that innovations of high value that are manufactured for one group, industry, or system will be adopted by unrelated groups, industries, or systems. For example, a flat-panel television designed for personal home use may be adopted by a restaurant as a

menu board. The flat panel television provides the restaurant operator an option to dynamically display pricing that a fixed menu board does not allow. The spillover effect often manifests as a secondary group of customers who purchase the focal products and services. Vernon (1979) suggests that demand for high-value innovations occurs even when it does not seem like there is a natural fit.

Resource-Based View (RBV) Theory suggest that firms allocate resources to attract customers (Wernerfelt, 1984). From their marketing analysis, firms develop a primary customer base. This primary marketing group is the high-valued customers that maximize the return on marketing expenditures (Blattberg & Deighton, 1996). Although firms do not directly market to the customers in the secondary market, it is a reasonable argument that firms will accept their patronage. As such, as a result of the firm's marketing efforts to attract high-valued customers, there will be a spillover and low-valued customers will adopt the firm's products and services. The product and services are designed for high-valued customers (Wernerfelt, 1984), but these innovations provide value for low-valued customers as well. The level of spillover is impacted by how persuasive the attributes of the innovations are to the secondary customers.

Persuasion

The persuasion stage of diffusion and adoptions occurs when a favorable or unfavorable attitude towards the innovation is made (Weenig & Midden, 1991). Potential adopters' attitudes are cultivated by mass media or word-of-mouth influences. Additionally, opinion leaders and change agents have an influence on the adoption unit's view on an innovation (Turnbull & Meenaghan, 1980). However, the attributes or characteristics of the innovation have an equally important role in forming the adoption unit's opinion of the innovation. Adoption decisions are impacted by the relative advantage, compatibility, complexity, trialability, and observability of the innovation in relation to the status quo (Gatignon & Robertson, 1985).

Relative advantage is defined as how much better a new product or service is compared to existing products and services (Rogers, Shoemaker, & Floyd, 1971). Holding all other attributes constant, a car that travels 50 miles per the gallon will have a relative advantage over a car that only

travels 40 miles per the gallon. As such, an innovation's relative advantage benefits may be perceived as economic (i.e., miles per gallon) (Rogers, 2010). Another example of economic relative advantage is from the seminal hybrid corn seed study. The yield of the hybrid corn seed was greater than the traditional corn seed (Ryan & Gross, 1950). Relative advantage attributes are not always economical. In Miller's (1957) study, he measured relative advantage or the effectiveness of different smallpox inoculations. As the relative advantage increases, the likelihood of adoption increases.

Compatibility is defined as how an innovation is compared to existing products and services (Gatignon & Robertson, 1985). Although they are classified as different vehicles, minivans and sport utility vehicles (SUV) are similar. As a result, it may be easy for a minivan owner to have a favorable impression of an SUV, as they have similar features and functionality. Compatibility has two dimensions: cognitive and operational compatibility. Cognitive compatibility is how an individual feels about an innovation. A bachelor with no intention of settling down may opt for the SUV over the minivan as he may feel the minivan is a family car. Although the minivan is similar to the SUV, it is not a well-matched vehicle in terms of his beliefs. On the other hand, operational compatibility is how close the innovation is to what people do. In the case of the minivan and the SUV, they are operationally similar as they both are vehicles (Karahanna, Agarwal, & Angst, 2006). So cognitive compatibility deals with how the potential adopters feel about the innovation, whereas as operational compatibility explores challenges of incorporating the innovation into existing routines. Overall, as compatibility increases, the likelihood of adoption increases (Rogers et al., 1971).

Complexity is defined as the level of difficulty involved with using a product or service. The perceived difficulty of a new product is often compared to existing products (Rogers et al., 1971). For example, when the automatic transmission car was manufactured, the perceived difficulty of driving a car decrease. As such, there was widespread adoption of the automatic transmission car. Some innovations are used naturally by members of a social system. Other innovations take more time to understand their functionality; as such, they will be adopted more slowly (Gatignon & Robertson, 1985). Complexity also involves how easy it is to convey the innovation to others (Rothman, 1974).

Overall, as the complexity of the innovation increases, the adoption time increases (Tornatzky & Klein, 1982) and the likelihood of adoption decreases (AlBar & Hoque, 2017).

Trialability is defined as how committed an individual or adoption unit needs to be to use the product (Rogers, 2010). There is a lower degree of commitment when a customer leases a car as opposed to financing (to own) a car. A leasing customer can walk away from the car after the term of the lease. However, there are fewer options for the customer who finances the car. When innovations are divisible, trialability is increased. Customers can purchase a can of soda or a case of soda. Giving the customer the option to buy a can of soda increases trialability. As the perceived trialability of an innovation increases, the likelihood of adoption increases. (Ryan & Gross, 1943).

Observability is defined as whether the consumers can see other individuals using the product. (Rogers et al., 1971). Consumers who see their neighbors adopt SUVs may then adopt one as well. By witnessing the neighbor adopting the SUV, the customers' uncertainty is reduced. The SUV stays top of mind as customers see more members of their social circles adopting SUVs. When the innovation stays top of mind of an adopter, they are more likely to adopt (Berger & Schwartz, 2011). As such, innovation observability has been found to be consistently significant in innovation adoption (Tornatzky & Klein, 1982). Collectively, the attributes of an innovation impact the likelihood of its being adopted by a social system.

System

In diffusion of innovation, a social system is conceived of as a group in which there is commonality among its members (Rogers, 2010). Social systems theory characterizes a system as a group or organization that follow system norms (Luhmann, 1995). While the commonalities frame which individuals qualify for membership, they also set a boundary for the group overall. It is the boundaries that make one system different from another system (Luhmann, 2006). Differences, distinctions, or boundaries can create subsystems within systems. For example, there is the faculty that serves an educational institution. Within that educational system, there is a distinction between

tenure-track and clinical faculty. What is important is that each social system serves a function (Luhmann, 1982).

For an illustration, we can turn again to the Ryan and Gross (1950) investigation of corn farmers in Iowa. Their commonality was that they were farmers in Iowa growing corn. Although farmers in Illinois share commonalities with Iowa farmers, i.e., growing produce in similar climates, they are excluded from the Iowa corn farmer system. Although the Iowa corn farmers have commonalities, how they perceive and adopt innovations or what is characterized as their level of innovativeness allows for subgroup segmentation.

Previous researchers categorized adopters by their innovativeness or the degree of uncertainty they exhibit towards innovations. (Rogers & Kincaid, 1981). The adopters who have the most innovativeness are the innovators, followed by early adopters, early majority, late majority, and finally laggards. The innovator group is also characterized as being active in seeking new ideas and is less concerned with uncertainty. Laggards, who are on the other extreme of the spectrum, are characterized as individuals resistant to change, traditional, irrational, and uneducated (Rogers, 2010).

Cooperatives

Although system theory suggests that attributes such as innovativeness create boundaries and form distinct systems (Luhmann, 2006), no system is completely closed (Kast & Rosenzweig, 1972). Under normal economic conditions, firms use resources to develop innovations to be consumed by high-valued customers (Wernerfelt, 1984). Firms are characterized as systems that develop innovations, and customers are a distinctly different system that consumes the firm's innovations. However, cooperatives are a uniquely formed system that combines both the firm and the customer (Bonin, Jones, & Putterman, 1993). Cooperatives are closed system of members and use the exclusivity feature of membership to create value for its members (Ortmann & King, 2007). Like other systems, cooperatives are not completely closed (Luhmann, 2006), and there is a spillover of value to nonmembers (d'Aspremont & Jacquemin, 1988).

Based on Rogers' (2010) Diffusion of Innovation Theory, scientific knowledge is an innovation that has been created in line with the social norms of a system, the scientific community. The social norms of the scientific community have created a distinction between sciences and practice (Luhmann, 2006). However, the scientific community behaves like a cooperative, a producer, and a consumer of innovations (Bonin et al., 1993); but despite this, the science community has a limited impact on practice. It is also the case that practice is its own system, and most external forces will have little influence over its behavior (Rasche & Behnam, 2009). So I expect that most scientific knowledge will not reach the practitioner. Notwithstanding the limiting factors of social systems, some academic knowledge spills over into practice, e.g. agency theory.

The science-practice gap has been an ongoing discussion in management literature (see Table 1). As such, numerous theories have been put forward on how the science-practice gap can be bridged. Bartunek & Rynes (2014) suggest viewing the gap with a "dialectic perspective." By doing so, science and practice are viewed as two opposing forces, and the tension between the two systems creates a climate for change. Eventually, with integration attempts, the tension between science and practice will resolve. Actor network theory (ANT) has also been suggested as an alternative lens to frame a solution. Under ANT, science and practice are an interconnected network; when there is a shared problem, the gap will be bridged. However, once shared problems are resolved, the gap will reemerge (Knights & Scarbrough, 2010). Van de Ven & Johnson (2006) use the tenets of arbitrage pricing theory to frame the gap as a knowledge production problem. They suggest that if scholars deploy the "engaged scholarship" approach (involving practitioners in the research process), the gap would be bridged. This dissertation is different as it places a greater emphasis on innovation (academic knowledge). By expanding the boundaries of DOI, this study seeks to further understand the science-practice gap.

Table 1: Management Related Articles about the Science-Practice Gap
(A list of keywords used in the Scopus search is found in Table 36)

Year	Article (Full Reference)	Description	Relevant Findings
1985	Lansley, P. (1985). Putting organizational research into practice. Construction Management and Economics, 3(1), 1-14.	Conceptual Article	The study draws upon prior research to suggest that the AROUSAL system is a method to bridge the science-practice gap.
1988	Browne, J. (1988). Production activity control—a key aspect of production control. The International Journal of Production Research, 26(3), 415-427.	Conceptual Article	The study suggests the perceived difficulty is the reason for lack of practice using a PAC scheduling technique.
1996	Abrahamson, E. (1996). Management fashion. Academy of Management. The Academy of Management Review, 21(1), 254.	Conceptual Article	Puts forth a theory on how management scholars can influence practice.
1996	Becker, B., & Gerhart, B. (1996). The impact of human resource management on organizational performance: Progress and prospects. Academy of Management Journal, 39(4), 779-801.	Conceptual Article	There needs to be better communication between academic and managers. Managers often know things that impact their decisions that researchers do not know. The need for more research with adoption as the dependent variable.
1996	Parr, M.G. (1996). The relationship between leisure theory and recreation practice. Leisure Sciences, 18(4), 315-332.	Empirical Article; N=20 (public service leisure managers)	The study finds there is a relationship between theory and practice among the participants. However researchers and practitioners have different understanding of the theories.
1996	Robinson, V.M. (1998). Methodology and the research-practice gap. Educational Researcher, 27(1), 17-26.	Conceptual Article	The article puts forth that the methodology used by researchers impacts how the theory is put into practice.
1998	Hamlin, B., Reidy, M., & Stewart, J. (1998). Bridging the HRD research-practice gap through professional partnerships: A case study. Human Resource Development International, 1(3), 273-290.	Conceptual Article	The article uses a case study in Human Resource Development to suggest that the science practice-gap can be bridged by using partnerships.
1998	Scherer, A.G. (1998). Pluralism and incommensurability in strategic management and organization theory: A problem in search of a solution.	Conceptual Article	The author suggest that academic and practitioners together create new rules for working together which includes creating a common language.
2000	Arnold, G.C., & Hatzopoulos, P.D. (2000). The theory□practice gap in capital budgeting: evidence from the United Kingdom. Journal of Business Finance & Accounting, 27(5□6), 603-626.	Empirical Article; N = 300 UK companies	The article finds support for a narrowing of the science-practice gap in regards to DCF methodology.
2001	Boland Jr, R.J., Singh, J., Salipante, P., Aram, J.D., Fay, S.Y., & Kanawattanachai, P. (2001). Knowledge representations and knowledge transfer. Academy of Management Journal, 44(2), 393-417.	Empirical Article	Drawing upon cognitive an educational psychology, the authors found support that managers are theorists as well as pragmatists. As such the construct their own knowledge and use knowledge created by others.
2001	Rynes, S.L., & McNatt, D.B. (2001). Bringing the organization into organizational research: An examination of academic research inside organizations. Journal of Business and Psychology, 16(1), 3-19.	Empirical Article; N = 141, research projects in real organizations.	The study finds that organizations are more open to partnering with academics for research.
2001	Rynes, S.L., Bartunek, J.M., & Daft, R.L. (2001). Across the great divide: Knowledge creation and transfer between practitioners and academics. Academy of Management Journal, 44(2), 340-355.	Forum Article	There is a gap in all fields that have researchers and practitioners. The article is a forum of possible solutions to the science practice gap.

Year	Article (Full Reference)	Description	Relevant Findings
2001	Starkey, K., & Madan, P. (2001). Bridging the relevance gap: Aligning stakeholders in the future of management research. British Journal of Management, 12, S3-S26.	Conceptual Article	There needs to be a restructuring of academia to improve knowledge exchange and dissemination. There needs to be a new measure of academic research impact. There needs to be new incentives.
2002	Connolly, F., & Sheahan, C. (2002). Development of an automated process planning and production activity control system for the manufacturing of engineered work surfaces. International Journal of Production Research, 40(15), 3725-3736.	Conceptual Article	This paper suggests the gap has been bridged in the theory-practice gap relating to the integration of planning and production activity control for manufacturing systems.
2002	Pfeffer, J., & Fong, C.T. (2002). The end of business schools? Less success than meets the eye. Academy of Management Learning & Education, 1(1), 78-95.	Conceptual Article	It is suggested the main goal of academic research is to impact a school's prestige. A distant second goal is to influence the practice of management. Also determined that a small number of Business Week's list of best business books were written by academics.
2003	Aram, J.D., & Salipante Jr, P.F. (2003). Bridging scholarship in management: Epistemological reflections. British Journal of Management, 14(3), 189-205.	Conceptual Article	The article suggests using the theories of knowledge of John Dewey and Ikujiro Nonaka to bridge the science practice gap.
2003	Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence□informed management knowledge by means of systematic review. British Journal of Management, 14(3), 207-222.	Conceptual Article	A systematic review process should be applied to the management field which is done in the medical field. It is suggested the practice would result in an enhanced practice by developing context-sensitive research.
2004	Aken, J.E.V. (2004). Management research based on the paradigm of the design sciences: the quest for field-tested and grounded technological rules. Journal of Management Studies, 41(2), 219-246.	Conceptual Article	Academic management research should create space for Management Theory research, based on the paradigm of the design sciences in addition to the more traditional Organization Theory research, based on the paradigm of the explanatory sciences.
2005	Van Aken, J.E. (2005). Management research as a design science: Articulating the research products of mode 2 knowledge production in management. British Journal of Management, 16(1), 19-36.	Conceptual Article	There should be a distinction between solution-oriented knowledge (Management Theory) and description-oriented knowledge (Organization Theory). The article highlights how to use both in management practice.
2005	Vermeulen, F. (2005). On rigor and relevance: Fostering dialectic progress in management research. Academy of Management Journal, 48(6), 978-982.	Conceptual Article	The author suggest that closing the gap will take more than changing the system, it will take academics wanting to make a difference.
2007	Bartunek, J.M. (2007). Academic-practitioner collaboration need not require joint or relevant research: Toward a relational scholarship of integration. Academy of Management Journal, 50(6), 1323-1333.	Conceptual Article	There needs to be more ways to create collaboration between academics and practitioners.
2007	Deadrick, D.L., & Gibson, P.A. (2007). An examination of the research–practice gap in HR: Comparing topics of interest to HR academics and HR professionals. Human Resource Management Review, 17(2), 131-139.	Empirical Article; N = 4300 HR theory and practice articles over 20 year period	The study found the theory-practice gap is relevant between topics of interest between theory and practice journals.
2007	Gulati, R. (2007). Tent poles, tribalism, and boundary spanning: The rigor-relevance debate in management research. Academy of Management Journal, 50(4), 775-782.	Conceptual Article	Suggests the gap is a result of tribalism. The article then recommends a 5 step integrative process to bridge the gap.

Year	Article (Full Reference)	Description	Relevant Findings
2007	Markides, C. (2007). In search of ambidextrous professors. Academy of Management Journal, 50(4), 762-768.	Conceptual Article	The solution to the gap is to have new researcher develop research that they teach to new students. Additionally, new faculty should look for research topics that are relevant to practice.
2007	Pfeffer, J. (2007). A modest proposal: How we might change the process and product of managerial research. Academy of Management Journal, 50(6), 1334-1345.	Conceptual Article	There needs to be a push for evidence based practice, like the field of medicine. The field needs to explore innovation process to understand what becomes influential.
2007	Rynes, S.L. (2007). Editor's afterword: Let's create a tipping point: What academics and practitioners can do, alone and together. Academy of Management Journal, 50(5), 1046-1054.	Conceptual Article	The author outlines what academics and professional organizations can do to narrow the science practitioner gap.
2007	Tushman, M., & O'Reilly III, C. (2007). Research and relevance: Implications of Pasteur's quadrant for doctoral programs and faculty development. Academy of Management Journal, 50(4), 769-774.	Conceptual Article	The authors suggests that it is best for business schools to operate in the Pasteur's quadrant, where rigour and relevance overlap.
2007	Vermeulen, F. (2007). "I shall not remain insignificant": Adding a second loop to matter more. Academy of Management Journal, 50(4), 754-761.	Conceptual Article	The author suggest that academic create a two loop communication system: one with other academics and another with practitioners.
2008	Abdullah, N.A.H., & Norin, S. (2008). The theory-practice gap of project appraisals. Journal Pengurusan (UKM Journal of Management), 27.	Empirical Article; N = 610 companies	The article found contrary evidence that the theory-practice is closing with regards to DCF
2008	Aguinis, H., & Pierce, C.A. (2008). Enhancing the relevance of organizational behavior by embracing performance management research. Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 29(1), 139-145.	Conceptual Article	The article suggests the investigation of performance management will bridge the science practice gap.
2008	Bardoel, E.A., De Cieri, H., & Mayson, S. (2008). Bridging the research–practice gap: Developing a measurement framework for work–life initiatives. Journal of Management & Organization, 14(3), 239-258.	Empirical Article; N = 27, medium to large companies	The article suggest that deploying a focus group method with practitioners will help bridge the science-practice gap.
2008	Brennan, R. (2008). Theory and practice across disciplines: implications for the field of management. European Business Review, 20(6), 515-528.	Conceptual Article	The article suggest that the goals of practitioners and academics are different and a result the gap widens.
2008	Carter, C.R. (2008). Knowledge production and knowledge transfer: closing the research–practice gap. Journal of Supply Chain Management, 44(2), 78-82.	Conceptual Article	The author offers 6 conceptual ways to close the research-practice gap.
2008	Dess, G.G., & Markoczy, L. (2008). Rather than searching for the silver bullet, use rubber bullets:Aa view on the research–practice gap. Journal of Supply Chain Management, 44(2), 57-62.	Conceptual Article	The author offers 4 conceptual ways to close the research-practice gap. One of the ways is boundary spanning by both the researcher and practitioner.
2008	Fillis, I., & Rentschler, R. (2008). Exploring metaphor as an alternative marketing language. European Business Review, 20(6), 492-514.	Conceptual Article	The author suggests that interjecting more metaphors is marketing is a pathway to closing the science practice gap.

Year	Article (Full Reference)	Description	Relevant Findings
2008	Hutt, M.D. (2008). Engaging Corporate Partners to Bridge the Theory–Practice Gap. Journal of Supply Chain Management, 44(2), 68-71.	Conceptual Article	The author suggests partnership agreements between researcher and practitioners will close the gap. The author also suggests key roles in the partnership.
2009	Barzelay, M., & Thompson, F. (2009). All aboard? Evidence-based management and the future of management scholarship. International Public Management Journal, 12(3), 289-309.	Literary Article; 3 character dialogue	The three characters of the literary article discusses Evidence-Based Management.
2009	Deadrick, D.L., & Gibson, P.A. (2009). Revisiting the research–practice gap in HR: A longitudinal analysis. Human Resource Management Review, 19(2), 144-153.	Empirical Article; N = 6300, HR articles	The authors find support for stable research–practice gap (Motivation-related issues), an increasing gap (Compensation & rewards), a decreasing gap (Employee/Labor relations), or no significant gap (HR Developments, Staffing).
2009	Fillis, I. (2009). An evaluation of artistic influences on marketing theory and practice. Marketing Intelligence & Planning, 27(6), 753-774.	Viewpoint Article	The author suggest viewing marketing managers as artists. As such it is an avant garde response to addressing the continuing theory/practice gap.
2009	Fincham, R., & Clark, T. (2009). Introduction: can we bridge the rigour–relevance gap?. Journal of Management Studies, 46(3), 510-515.	Viewpoint Article	The authors suggests that the science-practice gap phenomenon may have gone too far.
2009	Hodgkinson, G.P., & Rousseau, D.M. (2009). Bridging the rigour–relevance gap in management research: It's already happening!. Journal of Management Studies, 46(3), 534-546.	Conceptual Article	The authors provide examples on how the research-practice gap has been bridged with collaboration.
2009	Hozak, K., & Hill, J.A. (2009). Issues and opportunities regarding replanning and rescheduling frequencies. International Journal of Production Research, 47(18), 4955-4970.	Conceptual Article	The most valuable contributions of this study is the identification of the inconsistent conclusions between the shop floor, internal planning, and supply chain literatures about ideal replanning and rescheduling frequencies.
2009	Kieser, A., & Leiner, L. (2009). Why the rigour–relevance gap in management research is unbridgeable. Journal of Management Studies, 46(3), 516-533.	Conceptual Article	The gap is due to difference in language and logic.
2009	Moisander, J., & Stenfors, S. (2009). Exploring the edges of theory-practice gap: Epistemic cultures in strategy-tool development and use. Organization, 16(2), 227-247.	Case Study Article	The authors concluded that the development of strategy tools that actually support practical strategizing calls for a more social model of knowledge and strategy work.
2009	Reed, M.I. (2009). The theory/practice gap: a problem for research in business schools?. Journal of Management Development, 28(8), 685-693.	Conceptual Article	The authors suggests that a "dialogical" rather than "linear" model of knowledge production and dissemination favorable way to analyze the "theory/practice" gap.
2009	Ruona, W.E., & Gilley, J.W. (2009). Practitioners in applied professions: A model applied to human resource development. Advances in Developing Human Resources, 11(4), 438-453.	Conceptual Article	The authors developed a model to that describes four types of practitioners: atheoretical practitioners, practitioners, reflective practitioners, and scholar-practitioners. Scholars should look to discover ways to reach each type.
2009	Samad, F.A., & Shaharuddin, R.S. (2009). The perception of risk and uncertainty and the usage of capital budgeting techniques: Evidence from public listed firms in Malaysia. Jurnal Pengurusan (UKM Journal of Management), 29.	Empirical Article; N = 83, companies in Malaysia	The authors suggests that the theory-practice gap still exists in terms of DCF in Malaysia.

Year	Article (Full Reference)	Description	Relevant Findings
2010	Aguinis, H., Werner, S., Lanza Abbott, J., Angert, C., Park, J. H., & Kohlhausen, D. (2010). Customer-centric science: Reporting significant research results with rigor, relevance, and practical impact in mind. Organizational Research Methods, 13(3), 515-539.	Conceptual Article	The author recommends including practical impacts for practitioners in the academic articles.
2010	Bartunek, J.M., & Rynes, S.L. (2010). The construction and contributions of "implications for practice": What's in them and what might they offer?. Academy of Management Learning & Education, 9(1), 100-117.	Empirical Article	The author suggests there should be a greater push from publishers to require implication for practice sections in the articles.
2010	Bennouna, K., Meredith, G.G., & Marchant, T. (2010). Improved capital budgeting decision making: evidence from Canada. Management Decision, 48(2), 225-247.	Empirical Article; N = 88, firms	The authors find support for a narrowing gap in the DCF in Canada.
2010	Burke, L.A., & Rau, B. (2010). The research–teaching gap in management. Academy of Management Learning & Education, 9(1), 132-143.	Conceptual Article	The authors suggests that doctoral instruction is a key to minimize the science practice gap in the future.
2010	Gabrielsson, J., Tell, J., & Politis, D. (2010). Business simulation exercises in small business management education: using principles and ideas from action learning. Action Learning: Research and Practice, 7(1), 3-16.	Conceptual Article	The authors suggests closing the rigour-relevance gap in business school education by incorporating principles and ideas from action learning in small business management education.
2010	García□Izquierdo, A.L., Aguinis, H., & Ramos Villagrasa, P.J. (2010). Science–practice gap in e□recruitment. International Journal of Selection and Assessment, 18(4), 432-438.	Empirical Article; N = 142 companies	The authors find support for a science-practice gap in e-recruitment.
2010	Hutchins, H.M., Burke, L.A., & Berthelsen, A.M. (2010). A missing link in the transfer problem? Examining how trainers learn about training transfer. Human Resource Management, 49(4), 599-618.	Empirical Article; N = 139, surveys	The authors suggest HR executives consider how their training professionals receive and are held accountable for developing knowledge on evidence-based training transfer practices.
2010	Ko, D., & Fink, D. (2010). Information technology governance: an evaluation of the theory-practice gap. Corporate Governance: The International Journal of Business in Society, 10(5), 662-674.	Conceptual Article	The study was able to provide a theoretical framework of IT governance and apply this to provide insights into gaps between theory and practice that were observed within the four universities studied.
2010	Syed, J., Mingers, J., & Murray, P.A. (2010). Beyond rigour and relevance: A critical realist approach to business education. Management Learning, 41(1), 71-85.	Conceptual Article	The authors suggests in some instances, the research–practice gaps can be treated as natural because of divergent preferences of scholars and practitioners.
2011	Bechtel Jayanti, E. (2011). Through a different lens: A survey of linear epistemological assumptions underlying HRD models. Human Resource Development Review, 10(1), 101-114.	Conceptual Article	The authors suggests studying the research-practice gap using any type of linear model is fruitless as organizations become more complex.
2011	Garman, A.N. (2011). Shooting for the moon: How academicians could make management research even less irrelevant. Journal of Business and Psychology, 26(2), 129-133.	Conceptual Article	The article focuses on why this gap persists, and the kinds of fundamental shifts that would be required to address it. The authors urge all research's to take on the science-practice gap challenge.
2011	Gray, D.E., Iles, P., & Watson, S. (2011). Spanning the HRD academic-practitioner divide: bridging the gap through mode 2 research. Journal of European Industrial Training, 35(3), 247-263.	Conceptual Article	The author presents and evaluates examples of academic-practitioner partnerships in action (Mode 2 research). The author recommends strategies for the advancement of Mode 2 research.

Year	Article (Full Reference)	Description	Relevant Findings
2011	Kieser, A., & Leiner, L. (2011). On the social construction of relevance: A rejoinder. Journal of Management Studies, 48(4), 891-898.	Viewpoint Article	The authors offer counterview points to critics of their previous work.
2011	Miller, A.N., Taylor, S.G., & Bedeian, A.G. (2011). Publish or perish: academic life as management faculty live it. Career Development International, 16(5), 422-445.	Empirical Article; N = 438: tenured & tenure-track faculty	The authors suggest that publish or perish phenomenon is a contributor to the science practice gap.
2012	Bacchetti, A., & Saccani, N. (2012). Spare parts classification and demand forecasting for stock control: Investigating the gap between research and practice. Omega, 40(6), 722-737.	Case Study Article; N = 10	The authors find support of the existence of a significant gap between research and practice for spare parts management.
2012	Bansal, P., Bertels, S., Ewart, T., MacConnachie, P., & O'Brien, J. (2012). Bridging the research–practice gap.	Conceptual Article	The authors call for boundary spanning organizations as a means to bridge the science practice gap.
2012	Davison, R.M., Martinsons, M.G., & Ou, C.X. (2012). The roles of theory in canonical action research. MIS Quarterly, 763-786.	Conceptual Article	The authors suggest that they have enhanced CAR as a method and four challenges that contribute to a significant research–practice gap by augmenting the criteria and developing a clearer understanding of the role of theory.
2012	Lengnick-Hall, M.L., & Aguinis, H. (2012). What is the value of human resource certification? A multi-level framework for research. Human Resource Management Review, 22(4), 246-257.	Qualitative Article; N = 189, HR professionals	The authors provide 14 testable propositions, to guide future scholarly research on HR certification with the goal to gather evidence, which to date is not yet available, regarding the value of HR certification for individual practitioners, organizations, and the HR profession.
2012	Murray Lindsay, R. (2012). We must overcome the controversial relationship between management accounting research and practice: A commentary on Ken Merchant's "Making management accounting research more useful". Pacific Accounting Review, 24(3), 357-375.	Viewpoint Article	The authors suggests practical knowledge does not simply derive from basic ("scientific") knowledge "trickling down" to practice; instead, basic knowledge needs to be transformed into a theory or phronesis of management accounting in a manner that reflects the context and purpose of organizations.
2012	Wall, J., & Kressel, K. (2012). Research on mediator style: A summary and some research suggestions. Negotiation and Conflict Management Research, 5(4), 403-421.	Conceptual Article	The authors suggests the science-practice gap will is bridge with cooperation among researchers and the active search for collaborative practitioners and within practice settings.
2012	Wolf, J., & Rosenberg, T. (2012). How individual scholars can reduce the rigor-relevance gap in management research. Business Research, 5(2), 178-196.	Conceptual Article	The authors suggest that despite of all efforts, it would be almost impossible to close the rigor-relevance gap in management research totally.
2013	Aguinis, H., & Lawal, S.O. (2013). eLancing: A review and research agenda for bridging the science–practice gap. Human Resource Management Review, 23(1), 6-17.	Conceptual Article	The authors goal is introduce scholars and to set a research agenda for investigating this topic.
2013	Bullock, A., Morris, Z.S., & Atwell, C. (2013). Exchanging knowledge through healthcare manager placements in research teams. The Service Industries Journal, 33(13-14), 1363-1380.	Qualitative Article; N = 36	This study provides a detailed analysis of a healthcare management knowledge exchange programme. The study provides understanding of how mechanisms designed to support knowledge exchange and learning in healthcare management actually work in practice.
2013	Doherty, A. (2013). "It takes a village:" Interdisciplinary research for sport manage-ment. Journal of Sport Management, 27(1), 1-10.	Conceptual Article	The author suggests researchers take an interdisciplinary approach in research to help close the science-practice gap.

Year	Article (Full Reference)	Description	Relevant Findings
2013	Eva, N., & Sendjaya, S. (2013). Creating future leaders: an examination of youth leadership development in Australia. Education + Training, 55(6), 584-598.	Mixed Method Article; Interviews, N = 33; Surveys, N = 97	The authors suggest there exists a gap between the perceptions of the students and those of the teachers on what is taught and required in youth leadership development programs.
2013	Wanyama, S., Burton, B., & Helliar, C. (2013). Stakeholders, accountability and the theory-practice gap in developing nations' corporate governance systems: evidence from Uganda. Corporate Governance: The International Journal of Business in Society, 13(1), 18-38.	Qualitative Study	The authors find support for a gap between the theory and practice of corporate governance in Uganda.
2014	Aguinis, H., & Joo, H. (2014). Research on Hispanics benefits the field of management. Journal of Managerial Psychology, 29(6), 604-615.	Conceptual Article	The authors believe research on HLAs will bridge the science-practice gap, lead to the use of innovative research design and solutions for addressing ethical challenges and IRB regulations.
2014	Bartunek, J.M., & Rynes, S.L. (2014). Academics and practitioners are alike and unlike: The paradoxes of academic–practitioner relationships.	Conceptual Article	Puts forth that differing logics, time dimensions, communication styles, rigor and relevance, and interests and incentives are the reasons for the gap. It's okay that there is tension, but academics and practitioners need to develop closer relationships by engaging each other more.
2014	DeNisi, A.S., Wilson, M.S., & Biteman, J. (2014). Research and practice in HRM: A historical perspective. Human Resource Management Review, 24(3), 219-231.	Conceptual Article	The authors suggest research that can be translated into popular books may be much more influential than articles in any journals—even those aimed at practitioners.
2014	Glibkowski, B.C., McGinnis, L., Gillespie, J., & Schommer, A. (2014). "How" Narratology Narrows the Organizational Theory–Practice Gap. Human Resource Development Review, 13(2), 234-262.	Conceptual Article	The authors examine three causes of the theory-practice gap.
2014	Gummesson, E. (2014). The theory/practice gap in B2B marketing: reflections and search for solutions. Journal of Business & Industrial Marketing, 29(7/8), 619-625.	Conceptual Article	The authors suggests that the cause for the gap between science and practice is due to each being rewarded by difference criteria.
2014	Kulik, C.T. (2014). Working below and above the line: the research–practice gap in diversity management. Human Resource Management Journal, 24(2), 129-144.	Conceptual Article	The author suggests that there needs to be more collaboration among firms to reduce common method bias and produce results "above the line."
2014	Tucker, B., & D. Lowe, A. (2014). Practitioners are from Mars; academics are from Venus? An investigation of the research-practice gap in management accounting. Accounting, Auditing & Accountability Journal, 27(3), 394-425.	Mixed Method Article	The authors suggest the gap between academic research and practice in management accounting to be of limited concern to practitioners. The authors report the two most significant barriers to practitioners usage: difficulties understanding and limited access.
2014	Panda, A., & Gupta, R.K. (2014). Making academic research more relevant: A few suggestions. IIMB Management Review, 26(3), 156-169.	Review Article	Review of relevant Science-Practice Gap Articles.
2014	Roth, W.M., Mavin, T., & Dekker, S. (2014). The theory-practice gap: Epistemology, identity, and education. Education+ Training, 56(6), 521-536.	Conceptual Article	The authors offer insight on how the science-practice gap expresses itself and how it can be addressed.

Year	Article (Full Reference)	Description	Relevant Findings
2014	Tucker, B., & Parker, L. (2014). In our ivory towers? The research-practice gap in management accounting. Accounting and Business Research, 44(2), 104-143.	Empirical Article; N = 94	The authors find that the majority of respondents acknowledge a gap. However a small yet significant minority believes the problem is overstated.
2015	Bredillet, C.N., Tywoniak, S., & Dwivedula, R. (2015). Reconnecting theory and practice in pluralistic contexts: issues and Aristotelian considerations. Project Management Journal, 46(2), 6-20.	Conceptual Article	The author's purpose is to contribute, from a research practitioner perspective, to the theory–practice gap debate in organization studies.
2015	Bullinger, B., Kieser, A., & Schiller-Merkens, S. (2015). Coping with institutional complexity: Responses of management scholars to competing logics in the field of management studies. Scandinavian Journal of Management, 31(3), 437-450.	Empirical Article; N = 127	Using institutional theory, the authors argue that the science-practice gap is related to different logics of research aimed at scientific progress (basic research) or at relevant knowledge (applied research). Researchers tend to publish applied research in later periods of their careers.
2015	Carvalho, A.N., Oliveira, F., & Scavarda, L.F. (2015). Tactical capacity planning in a real-world ETO industry case: An action research. International Journal of Production Economics, 167, 187-203.	Case Study Article	This article present the findings of applying a decision support planning tool, based on an optimization model, in a real-world ETO production setting.
2015	Frisk, J.E., Bannister, F., & Lindgren, R. (2015). Evaluation of information system investments: a value dials approach to closing the theory-practice gap. Journal of Information Technology, 30(3), 276-292.	Conceptual Article	The article proposes a way for managers to improve IS investment evaluation by changing perspective from a focus on traditional analytic tools towards a design attitude that seeks to develop multicriteria IS evaluation approach based on contextual experience and prior knowledge.
2015	Hay, D.B., & Proctor, M. (2015). Concept maps which visualise the artifice of teaching sequence: Cognition, linguistic and problem-based views on a common teaching problem. Knowledge Management & E-Learning, 7(1), 36.	Conceptual Article	This article concludes that concept mapping shows the acquisition of a new vocabulary of legal concepts. However the method itself is rather less useful for showing whether or not students are developing the skills of making judgement.
2015	Hutt, M.D., & Walker, B.A. (2015). Bridging the theory-practice gap in business marketing: Lessons from the field—The JBBM at 21. Journal of Business-to-Business Marketing, 22(1-2), 67-72.	Conceptual Article	The authors suggest high levels of engagement and support from the partner organization occur when members of the partnering firm were actively involved in framing the research question.
2015	Mello, A.L., Fleisher, M.S., & Woehr, D.J. (2015). Varieties of research experience: Doctoral student perceptions of preparedness for future success. The International Journal of Management Education, 13(2), 128-140.	Empirical Article; N = 227, doctoral students	The authors suggest that Ph.D. programs emphasize theory over practice.
2015	Möller, K., & Parvinen, P. (2015). An impact-oriented implementation approach in business marketing research: Introduction to the Special Issue on "Implementing Strategies and Theories of B2B Marketing and Sales Management". Industrial Marketing Management, 45, 3-11.	Conceptual Article	The authors recommend an agenda for enhancing the managerial relevance of future business-marketing research.
2016	Adeniyi, O., Perera, S., & Collins, A. (2016). Review of finance and investment in disaster resilience in the built environment. International Journal of Strategic Property Management, 20(3), 224-238.	Conceptual Article	The authors has identified the need to build a body of literature in the area of investment in disaster resilience in the built environment.

Year	Article (Full Reference)	Description	Relevant Findings
2016	Banks, G.C., Pollack, J.M., Bochantin, J.E., Kirkman, B.L., Whelpley, C.E., & O'Boyle, E.H. (2016). Management's science–practice gap: A grand challenge for all stakeholders. Academy of Management Journal, 59(6), 2205-2231.	Mixed Method Article; Interviews, N = 38; Surveys, academics, N = 828 & practitioners, N = 939	The authors used a series of interviews to develop a list of grand challenges that researchers should tackle that would be useful for practitioners.
2016	Dalcher, D. (2016). Rethinking project practice: emerging insights from a series of books for practitioners. International Journal of Managing Projects in Business, 9(4), 798-821.	Review Article	The paper explores new advances in project management practice aligning them with key trends and perspectives identified as part of the Rethinking Project Management initiative.
2016	HakemZadeh, F., & Baba, V.V. (2016). Toward a theory of collaboration for evidence-based management. Management Decision, 54(10), 2587-2616.	Conceptual Article	The authors use the theory of collaboration as a guideline to establish and maintain the operation of an EBMgt collaboration as a means to close the science-practice gap.
2016	Hoidn, S., & Olbert-Bock, S. (2016). Learning and teaching research methods in management education: Development of a curriculum to combine theory and practice–a Swiss case. International Journal of Educational Management, 30(1), 43-62.	Empirical Article; N = 87, students	The authors suggest that instructors need to keep up to date with developments in academic research, management practice and research methods teaching.
2016	Marie Ryan, A., & Derous, E. (2016). Highlighting tensions in recruitment and selection research and practice. International Journal of Selection and Assessment, 24(1), 54-62.	Empirical Article; N = 165 HR professional, N = 2600 HR articles	The authors highlight 5 areas of tension in the research-practice gap.
2016	Nørreklit, H., Nørreklit, L., & Mitchell, F. (2016). Understanding practice generalization –opening the research/practice gap. Qualitative Research in Accounting & Management, 13(3), 278-302.	Conceptual Article	The research/practice gap is shaped by the very different language games played.
2016	Tenhiälä, A., Giluk, T.L., Kepes, S., Simón, C., Oh, I.S., & Kim, S. (2016). The Research□Practice gap in human resource management: A Cross□Cultural study. Human Resource Management, 55(2), 179-200.	Empirical Article; Finland N = 86, South Korea N = 147, & Spain N = 196	The study investigates the cross cultural beliefs of HR managers. HR managers are not evidence-based in their decision making and there are difference across country barriers.
2016	Tucker, B.P., & Schaltegger, S. (2016). Comparing the research-practice gap in management accounting: A view from professional accounting bodies in Australia and Germany. Accounting, Auditing & Accountability Journal, 29(3), 362-400.	Empirical Article; N = 33, accounting professionals	The authors suggest that access and relevance hinders bridging the science-practice gap.
2017	Batra, R., & Verma, S. (2017). Capital budgeting practices in Indian companies. IIMB Management Review, 29(1), 29-44.	Empirical Article; N = 77 companies	The science-practice gap is not significant in terms of capital planning.
2017	Brodie, R.J., Nenonen, S., Peters, L.D., & Storbacka, K. (2017). Theorizing with managers to bridge the theory-praxis gap: foundations for a research tradition. European Journal of Marketing, 51(7/8), 1173-1177.	Conceptual Article	The authors sets a research agenda for closing the science-practice gap.

Year	Article (Full Reference)	Description	Relevant Findings
2017	Busse, C., Kach, A. P., & Wagner, S. M. (2017). Boundary conditions: What they are, how to explore them, why we need them, and when to consider them. Organizational Research Methods, 20(4), 574-609.	Conceptual Article	The authors using conceptual analyses and prior research, developed a more accurate and explicit understanding of boundary conditions in the science-practice gap.
2017	Grote, G., & Guest, D. (2017). The case for reinvigorating quality of working life research. Human Relations, 70(2), 149-167.	Conceptual Article	The authors argue that a quality work life agenda should pursue mutual benefits for workers and management.
2017	Kohli, A.K. (2017). Theorizing with managers: Nenonen et al. are right on! European Journal of Marketing, 51(7/8), 1161-1162.	Conceptual Article	The author endorse theorizing with managers.
2017	Leeflang, P.S. (2017). Bridging the gap: reflections on theorizing with managers. European Journal of Marketing, 51(7/8), 1153-1160.	Conceptual Article	The authors suggests cooperation with marketing managers is most successful when the initiator is the practitioner. Public policy and litigation are the most promising areas for cooperation.
2017	Markoulli, M., Lee, C.I., Byington, E., & Felps, W.A. (2017). Mapping Human Resource Management: Reviewing the field and charting future directions. Human Resource Management Review, 27(3), 367-396.	Empirical Article; N = 12,157 HR articles	The author finds 100 topics that dominate the HR science-practice gap and puts forth an agenda for 7 more topics.
2017	Moats, J.B. (2017). Planting seeds: Actively developing scholar-practitioners. Advances in Developing Human Resources, 19(3), 279-294.	Case Study Article; N = 2	The author attempts to show how the definitions of scholar-practitioners can be used as a basis for developing scholar-practitioners.
2017	Möller, K. (2017). Questioning the theory-praxis gap in marketing–Types and drivers of research implementation. European Journal of Marketing, 51(7/8), 1163-1172.	Conceptual Article	The author suggest that we should embrace scientific pluralism, change the way we educate our doctoral students, and challenge the rules of publishing.
2017	Pullins, E.B., Timonen, H., Kaski, T., & Holopainen, M. (2017). An investigation of the theory practice gap in professional sales. Journal of Marketing Theory and Practice, 25(1), 17-38.	Qualitative Article	The author suggest that academics should produce knowledge that is more relevant, through appropriate research questions and contextualized research designs.
2017	Simba, A., & Ojong, N. (2017). Engaged scholarship: Encouraging interactionism in entrepreneurship and small-to-medium enterprise (SME) research. Journal of Small Business and Enterprise Development, 24(4), 1009-1027.	Conceptual Article	The authors propose a multi-layered framework for entrepreneurship researchers, and the practitioner community with a taxonomy to use for encouraging joint approach to research.
2017	Tanskanen, K., Ahola, T., Aminoff, A., Bragge, J., Kaipia, R., & Kauppi, K. (2017). Towards evidence-based management of external resources: Developing design propositions and future research avenues through research synthesis. Research Policy, 46(6), 1087-1105.	Empirical Article; N = 601	The key contribution in the author's identification of future research opportunities and directions to advance science in the field of ERM.
2018	Arar, K. (2018). Using insider research in MEd final projects to bridge the theory/ practice gap. International Journal of Leadership in Education, 21(4), 462-478.	Case Study Article	The article provides a model to bridge the gap between theory and practice.
2018	Asmussen, J.N., Kristensen, J., Steger-Jensen, K., & Wæhrens, B.V. (2018). When to integrate strategic and tactical decisions? Introduction of an asset/inventory ratio guiding fit for purpose production planning. International Journal of Physical Distribution & Logistics Management, 48(5), 545-568.	Conceptual Article	The authors suggest a fit between planning processes, the production system and planning environment and provides a future research agenda.

Year	Article (Full Reference)	Description	Relevant Findings
2018	Carton, G., & Ungureanu, P. (2017). Bridging the Research–Practice Divide: A Study of Scholar-Practitioners' Multiple Role Management Strategies and Knowledge Spillovers Across Roles. Journal of Management Inquiry, 1056492617696890.	Qualitative Article; N = 16	The author discuss how the strategic management of teaching, research and practical application roles can help bridge academic and practice worlds.
2018	Gill, C. (2018). Don't know, don't care: An exploration of evidence based knowledge and practice in human resource management. Human Resource Management Review, 28(2), 103-115.	Conceptual Article	The author suggest there is no incentive for either researchers or practitioners to change the status quo.
2018	Ramsgaard, M.B., & Østergaard, S.J. (2018). An entrepreneurial learning approach to assessment of internships. Education+ Training, 60(7/8), 909-922.	Qualitative Article; N = 32 interviews	The authors found support that by using an entrepreneurial learning approach students in internships collectively develop a comprehensive understanding of how to apply theory to practical settings.
2019	Amara, N., Olmos-Peñuela, J., & Fernández-de-Lucio, I. (2019). Overcoming the "lost before translation" problem: An exploratory study. Research Policy, 48(1), 22-36.	Conceptual Article	The authors deploy Stokes' (1997) framework to position the disconnection between theory and practice as a knowledge production problem.
2019	Melão, N., Bastida, R., & Marimon, F. (2017). Assessing a quality model for the social sector: an empirical study of the EQUASS model. Total Quality Management & Business Excellence, 1-23.	Empirical Article; N = 339, organizations	The authors provide a better understanding of the causal relationships between quality management practices embedded in the EQUASS model.

Using Rogers' (2010) Diffusion of Innovation Theory to explore the science-practice gap is not a new phenomenon (see Table 2). In the field of accounting, a group of researchers investigated the barriers that prevented scientific accounting knowledge from reaching practitioners. Their results suggest that how the findings are communicated may prevent diffusion (Tucker & Schaltegger, 2016). Murray (2009) suggests that using the tenets of the Diffusion of Innovation Theory will assist with the use of counseling research. More importantly, Rogers (2010, p. 1) stated: "There is a wide gap in many fields, between what is known and what is actually put into use." As such, "diffusion research has a pragmatic appeal in getting research results utilized…. The diffusion approach helps connect research-based innovations with the potential users of such innovations in a knowledge-utilization process" (Rogers, 2003, p. 104-105).

Table 2: Selected Articles using Diffusion of Innovation to Address Science Practice Gap

Year of Publication	Subject Areas	Article (full reference)	Description	Relevant Findings
2016	Accounting	Tucker, B.P., & Schaltegger, S. (2016). Comparing the research-practice gap in management accounting: A view from professional accounting bodies in Australia and Germany. Accounting, Auditing & Accountability Journal, 29(3), 362-400.	Qualitative Article; Interviews:N = 33, accounting professionals	Communication of accounting research is a barrier to diffusion
2014	Accounting	Tucker, B., & Parker, L. (2014). In our ivory towers? The research-practice gap in management accounting. Accounting and Business Research, 44(2), 104-143.	Empirical Article; N = 64, accounting academics	Accounting Academics believe there is a widening gap between science and practice, with a small minority believing it is appropriate.
2014	Accounting	Tucker, B., & Lowe, A. (2014). Practitioners are from Mars; academics are from Venus? An investigation of the research-practice gap in management accounting. Accounting, Auditing & Accountability Journal, 27(3), 394-425.	Mixed method Article; Interviews & Surveys, N = 19	The findings suggest that practitioners dismiss the findings of academics.
2009	Counseling	Murray, C.E. (2009). Diffusion of innovation theory: A bridge for the research-practice gap in counseling. Journal of Counseling & Development, 87(1), 108-116.	Conceptual Article	The findings suggest that researchers should pick more relevant topics and find better ways to communicate the findings to practitioners.
2009	Health Professions	Green, L.W., Ottoson, J.M., Garcia, C., & Hiatt, R.A. (2009). Diffusion theory and knowledge dissemination, utilization, and integration in public health. Annual Review of Public Health, 30, 151-174.	Conceptual Article	To implement a more evidence-based practice, there needs to be more practice-based evidence.

Hypothesis Development

Formally, an innovation is an idea, practice, or object perceived as new (Rogers, 2010). Innovation in a field of scientific research provides researchers with alternative paradigms and new approaches to model solutions (Kuhn, 1962). Like other innovations, scientific research innovations are clouded with uncertainty, and this impacts diffusion (Roger & Kincaid, 1981). The uncertainty that surrounds the innovation allows researchers to advance or debunk scientific knowledge (Kuhn, 1962). To adopt an innovation, an adopting unit must progress through three stages of the innovation-decision process: knowledge, persuasion, and decision (Gatignon & Robertson, 1985).

The first stage of the innovation-decision process is coincidently named "knowledge" and occurs when the social system is exposed to the innovation (Rogers, 2010). In the case of scientific knowledge, exposure to the innovation may occur in an oral or written form (Hardwig, 1985). Scientific knowledge is communicated through the cultural and social institutions of science (Driver et al., 1994). However, in academia, scientific knowledge is traditionally stored in academic journals. Therefore, scientific knowledge is not typically communicated interpersonally (Audi, 2010), but is easily accessible and recallable like memorial knowledge (Lehrer, 1987).

Despite the impersonal nature of sharing of academic knowledge, there are conversations regarding academic innovations. Ultimately, the sharing of knowledge within the scientific community leads to the convergence or divergence of ideas regarding the innovation (Rogers & Kincaid, 1981). The converging and diverging of ideas regarding innovations leads to interrelated but distinct social systems with varying attitudes towards the innovation.

The persuasion stage occurs when a favorable or unfavorable attitude towards the innovation is made (Rogers, 2010). Potential adopter's attitudes are cultivated by mass media or word-of-mouth influences (Turnbull & Meenaghan, 1980). In the traditional sense, mass media includes all forms of advertising and personal selling (Rogers, 2010). Mass media channels include change agents, who look to change diverging opinions towards the innovation (Rogers et al., 1971). They look to change the status quo (Ottaway, 1983) and reduce innovation uncertainty (Turnbull & Meenaghan, 1980). However, change agents do not always work directly for the innovation's creator (Ottaway, 1983). Change agents can be a passive influence on adoptions decisions (Turnbull & Meenaghan, 1980). Branding or an association to a group are forms of passive change agent influence (Gad & Nicholas, 2003).

Opinion leaders are individuals who influence the attitudes of members within a social system (Rogers & Cartano, 1962). Whereas change agents are viewed as an impersonal source of persuasion, opinion leaders use their interpersonal relationships for persuasion within a social system (Turnbull & Meenaghan, 1980). Although opinion leaders facilitate sharing between different social systems or

groups, their reach is limited (Kratzer & Lettl, 2009). Opinion leaders persuade members of their social system by initiating word of mouth. When uncertainty decreases around an innovation and the social system favors change, the opinion leaders are viewed as innovators. However, when uncertainty increases and the social system is resistant to change, opinion leaders adopt innovations later than innovators (Venkatraman, 1989). As a result of their duality, opinion leaders are not innovators.

The decision stage occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation. Recall, the social system in which the adopter resides impacts innovation adoption decisions. The optimal innovation-decision occurs when the end-user choice to adopt is made absent of the influence of the system in which they belong. A collective-innovation decision is when a consensus is made among the members of the system. When the decision to adopt is made for a system by one or two individuals within the system, then an authority innovation-decisions is made (Hoffmann et al., 2007).

For the purpose of this study, an optional innovation decision is the focus and the decision to adopt or not adopt occurs at some point along the innovation experience time continuum. Innovators, the first to adopt innovations, seek out new knowledge, are more comfortable with uncertainty, and need less experience with the innovation to decide to adopt. Innovators decide to adopt earlier on the experience time continuum. Laggards are comfortable with the status quo, uncomfortable with uncertainty, and rely on the experience of others in their social network as a gauge of when to decide to adopt. As a result, laggards adopt later on the experience time continuum (Rogers, 2010).

Although the scientific community is a distinct system, it is not completely closed (Luhmann, 2006). The scientific community is like a cooperative that both produces and consumes innovations (Ortmann & King, 2007). Users of academic knowledge are other academics, textbook authors, popular press authors, consultants, and practitioners. It is these users who amplify the spillover effect that ultimately drives the diffusion process (Rogers, 2010). However, the diffusion of new scientific knowledge through the scientific community and beyond is difficult (Rogers, 2010).

The largest impediment in the diffusion process is the nature of communications among a system's actors. The diffusion process occurs as individuals with knowledge of the innovation (scientific knowledge) share it with others (Weenig & Midden, 1991). The ease of communication depends on the homophily of the group or how closely related individuals are in terms of attributes such as beliefs, education, and social status (Lazarsfeld & Merton, 1964). Regardless of the homophily of the group, knowledge spillover of innovative products occurs (Audretsch & Keilbach, 2007). Additionally, the diffusion process is impacted by how the adopters perceive the innovation (Star & Griesemer, 1989).

The academics in the scientific community are not only the manufacturers of the knowledge; they are the innovators of the larger system of scientific knowledge adopters. On the diffusion timeline, academics not only serve as the manufacturers of academic knowledge, they fill this role of a consumer or innovator. They are the first to adopt scientific knowledge and need less experience with the innovations to adopt (Turnbull & Meenaghan, 1980; Rogers, 2003). Whereas the academics who serve as the innovators of scientific knowledge are using the innovation to create additional innovations, textbook authors are looking to maintain the boundaries of a disciple by what subjects they include or exclude (Issitt, 2004). As such, I posit that textbook writers are in a later adopter category.

In addition to access, uncertainty plays a larger role for the later adopters in the diffusion process (Rogers & Kincaid, 1981). The early majority group is characterized as conservative and deliberate in their adoption process (Turnbull & Meenaghan, 1980). The late majority group is characterized as skeptics and adopts after the innovation becomes mainstream; laggards stick with the status quo until it is no longer an option (Turnbull & Meenaghan, 1980). However, dividing adopters into five groups is unnecessary. Bass (2004) recommends dichotomizing the adopters into innovators and imitators. Only the innovators, the first group to adopt, is not influenced by opinion leaders or change agents (Rogers, 2003; Bass, 2004).

All the subsequent adoption groups are just imitating the initial adoption group (other academic researchers). As recommended by Bass (2004), this dissertation will use two systems to divide the adoption group. The innovator group consists of the cooperative, the academic community that produces and consumes academic knowledge. All other users of academic knowledge are the imitators. With both the innovator group (science) and the imitator group (practice) forming distinct systems, this dissertation will uniquely investigate the adoption of innovation from one system to another.

We know that both opinion leaders and change agents can exercise vital influence on the adoption process. However, their success is impacted by the characteristics of the innovation (Venkatraman, 1989). Diffusion rates are impacted by the relative advantage, compatibility, complexity, trialability, and observability of the innovation in relation to the status quo (Rogers, 2010).

Hypotheses

"The diffusion approach helps connect research-based innovations with the potential users of such innovations in a knowledge-utilization process" (Rogers, 2003, p. 104). How quickly the connection happens depends on the characteristics of the innovation or, in this study, the scientific knowledge (Rogers, 2010). The relative advantage an innovation has over the previous innovations will impact the rate of diffusion. Relative advantage is the degree to which an innovation is perceived as better than the old idea (Roger & Shoemaker, 1971). By using diffusion of innovation theory, it easy to argue that if a discovery or scientific knowledge has a relative advantage over the existing body of knowledge, it will be adopted beyond the group of innovators.

Hypothesis 1: As the relative advantage of scientific knowledge improves over the existing body of knowledge, the likelihood increases that the new scientific knowledge spills over and is adopted by the imitators.

Scientific knowledge that is aligned with existing thoughts and communicated in a method that is understandable by the adoption community will diffuse further. The Diffusion of Innovation Theory states that compatibility is the degree to which an innovation is perceived to be consistent with

existing values, experience, and the needs of potential adopters (Rogers, 2010). Compatibility has two dimensions: cognitive and operational compatibility. The former deals with how the potential adopters feel about the innovation, and the latter is about their belief incorporating the innovation into their existing routines. Overall, as compatibility increase, the rate of adoption increases (Rogers et al., 1971).

Hypothesis 2: As the perceived compatibility of scientific knowledge is congruent with the adoption community's beliefs, the likelihood increases that the new scientific knowledge spills over and is adopted by the imitators.

From the Diffusion of Innovation Theory, we understand that innovation has a complexity dimension, which is the degree to which it appears to be difficult to understand and use (Rogers et al., 1971). Some innovations are used naturally by members of a social system. Other innovations require more time to understand their functionality, and as such they will be adopted more slowly (Rogers, 2010). Complexity also involves how easy it is to convey the innovation to others (Rothman, 1974). Overall, as the complexity of the innovation increases, the adoption time increases (Tornatzky & Klein, 1982) and the rate of adoption decreases (AlBar & Hoque, 2017).

Hypothesis 3: As the perceived complexity of scientific knowledge increases over the existing body of knowledge, the likelihood decreases that the new scientific knowledge spills over and is adopted by the imitators.

Innovations that can be used on a trial or limited bases diffuse and are more likely to be adopted past the innovator group. Highly divisible innovations are usually highly trialable; however, not all trialable innovations are divisible. Innovations that are divisible and can be implemented over time are adopted at a faster rate (Ryan and Gross, 1943). So, scientific knowledge that allows the adopter to test part of the innovation without fully committing will more likely be adopted past the innovator group.

Hypothesis 4: As the perceived trialability of scientific knowledge increases over the existing body of knowledge, the likelihood increases that the new scientific knowledge spills over and is adopted by the imitators.

From the diffusion of innovation theory, we understand that visibility of the innovation impacts adoption. As the adoption community sees, hears, or observes the innovation is used, it is more likely to diffuse through the adoption community. The more times individuals can see the results of an innovation, the more likely they are to adopt (Rogers, 2010). Innovation observability has been found to be consistently significant in innovation adoption (Tornatzky & Klein, 1982).

Hypothesis 5: As the perceived observability of scientific knowledge increases over the existing body of knowledge, the likelihood increases that the new scientific knowledge spills over and is adopted by the imitators.

Based on Rogers' (2010) Diffusion on Innovation Theory, scientific knowledge is an innovation that has been created in line with the social norms of a system, the scientific community. The social norms of the scientific community have created a distinction between sciences and practice that has limited the impact of science on its environment, i.e., practice (Luhmann, 2006). However, we understand from DOI that later adopters are influenced by change agents. Change agents work to reduce the uncertainty surrounding the innovation. As such, change agents are instrumental in influencing later adopter groups to accept an innovation (Rogers, 2003). The influence of the change agent can occur in both an active and passive fashion (Turnbull & Meenaghan, 1980).

Hypothesis 6: The relationship between the innovation characteristic of scientific knowledge and imitator's adoption is impacted by change agent influence, such that as the influence of the change agent increases, the likelihood increases that scientific knowledge spills over and is adopted by the imitators.

Table 3 shows the study's research model explained in this section.

Table 3: Diffusion of Innovation by Academic Research Areas

Academic Research Area	Innovation Studied
Agricultural economics	A wide variety of new ideas
Anthropology	Technological ideas (steel ax, the horse, water boiling)
Communication	News events, technological innovations
Earth Sociology	City manager government, postage stamps, ham radios
Economics	A wide variety of new ideas
Education	Teaching / Learning innovations (kindergartens, modern math, programmed instruction, team teaching)
General Sociology	A wide variety of new ideas
Geography	Technological innovations
Industrial Engineering	A wide variety of new ideas
Marketing	New product (a coffee brand, the touch-tone telephone, clothing fashions)
Political Science	A wide variety of new ideas
Psychology	A wide variety of new ideas
Public Health and medical sociology	Medical and health ideas (drugs, vaccinations, family planning methods, CAT scanner)
Rural Sociology	Agricultural ideas (weed sprays, hybrid seed, fertilizers)
Statistics	A wide variety of new ideas

Sources: Rogers, E.M. (2010). Diffusion of innovations. Simon and Schuster.

CHAPTER III

METHODOLOGY

In this chapter, I will describe the methods used to test the hypotheses proposed in Chapter II. The purpose of this dissertation is to address two significant questions: 1) Can the innovation characteristics of academic knowledge be used to predict whether that knowledge is adopted by a practitioner? 2) Can the innovation characteristics of academic knowledge be used to understand the degree of practitioner adoption? To answer these questions, I will examine two samples of academic articles. I will generate the first sample of adopted academic knowledge from a list of books listed on the *New York Times* Best Sellers list (Table 4). The second sample of adopted academic knowledge will be generated from the Altmetric.com database.

Study 1 – *New York Times* Best Sellers List

Following Pfeffer and Fong (2002), to create the list of adopted scientific knowledge, I will explore a random sample of popular press business books that have appeared on the *New York Times* Best Sellers list. During the investigation, I will prepare a list of academic articles (scientific knowledge) cited in the popular press books. Subsequently, I will code the innovation characteristic of each of the adopted articles.

By coding the innovation attributes, I provide a method to determine whether there is a significant statistical distinction between adopted and non-adopted articles. In academia, increased citation counts (relative advantage) have favorable impacts of authors and publication prestige (Stremersch, Verniers, & Verhoef, 2007). Additionally, researchers who present

Table 4. *New York Times* 2018 Best Sellers List

Year	Title	Author
2014	#Girlboss	Sophia Amoruso
2014	*Lean In: Women, Work, and the Will to Lead**	Sheryl Sandberg
2014 & 2018	*The Power of Habit: Why We Do What We Do in Life and Business**	Charles Duhigg
2014 & 2018	*Outliers: The Story of Success**	Malcolm Gladwell
2014 & 2018	*Thinking, Fast and Slow**	Daniel Kahneman
2018	Dare to Lead: Brave Work. Tough Conversations. Whole Hearts.	Brene Brown
2018	The CEO Next Door: The 4 Behaviors that Transform Ordinary People into World-Class Leaders	Elena L. Botelho and Kim R. Powell with Tahl Raz
2018	The Culture Code: The Secrets of Highly Successful Groups	Daniel Coyle
2018	*When: The Scientific Secrets of Perfect Timing**	Daniel H. Pink
2018	Winners Take All: The Elite Charade of Changing the World	Anand Giridharadas
2018	Bad Blood: Secrets and Lies in a Silicon Valley Startup	John Carreyrou
2018	Billion Dollar Whale: The Man Who Fooled Wall Street, Hollywood, and the World	Tom Wright and Bradley Hope
2018	Mastering the Market Cycle: Getting the Odds on Your Side	Howard Marks
2018	AI Superpowers: China, Silicon Valley, and the New World Order	Kai-Fu Lee
2018	Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones	James Clear
2018	Capital Gaines: Smart Things I Learned Doing Stupid Stuff	Chip Gaines
2018	Crushing It!: How Great Entrepreneurs Build Their Business and Influence—and How You Can, Too	Gary Vaynerchuk
2018	Dear Madam President: An Open Letter to the Women Who Will Run the World	Jennifer Palmieri
2018	Discipline Equals Freedom: Field Manual	Jocko Willink
2018	Don't Bullsh*t Yourself!: Crush the Excuses That Are Holding You Back	Jon Taffer
2018	Dopesick: Dealers, Doctors, and the Drug Company that Addicted America	Beth Macy
2018	Extreme Ownership: How U.S. Navy SEALs Lead and Win	Jocko Willink & Leif Babin
2018	Grit: The Power of Passion and Perseverance	Angela Duckworth
2018	I Love Capitalism!: An American Story	Ken Langone
2018	Leadership: In Turbulent Times	Doris Kearns Goodwin
2018	Measure What Matters: How Google, Bono, and the Gates Foundation Rock the World with OKRs	John Doerr
2018	On Grand Strategy	John Lewis Gaddis
2018	Principles: Life and Work	Ray Dalio
2018	Radical Candor: Be a Kick-Ass Boss Without Losing Your Humanity	Kim Scott
2018	Red Notice: A True Story of High Finance, Murder, and One Man's Fight for Justice	Bill Browder
2018	Rise and Grind: Outperform, Outwork, and Outhustle Your Way to a More Successful and Rewarding Life	Daymond John with Daniel Paisner
2018	Shoe Dog: A Memoir by the Creator of Nike	Phil Knight
2018	Skin in the Game: Hidden Asymmetries in Daily Life	Nassim Nicholas Taleb
2018	Soar!: Build Your Vision from the Ground Up	T.D. Jakes
2018	The Dichotomy of Leadership: Balancing the Challenges of Extreme Ownership to Lead and Win	Jocko Willink & Leif Babin
2018	The Laws of Human Nature	Robert Greene
2018	The Magnolia Story	Chip and Joanna Gaines with Mark Dagostino
2018	The Power of Moments: Why Certain Experiences Have Extraordinary Impact	Chip Heath & Dan Heath
2018	The Silk Roads: A New History of the World	Peter Frankopan
2018	The Undoing Project: A Friendship That Changed Our Minds	Michael Lewis
2018	Thirst: A Story of Redemption, Compassion, and a Mission to Bring Clean Water to the World	Scott Harrison with Lisa Sweetingham
2018	One Million Followers: How I Built a Massive Social Following in 30 Days	Seth Godin
2018	Tribe of Mentors: Short Life Advice from the Best in the World	Timothy Ferriss
2018	You Are a Badass at Making Money: Master the Mindset of Wealth	Jen Sincero

*Denotes a Popular Press Book selected in the sample

complex ideas using complex writing styles (complexity) are perceived as more competent than others who present simpler ideas and use simpler writing styles (Armstrong, 1980). However, this study will provide insight into whether these highly regarded measures for science are also good for measuring impact on practice.

Additionally, I will generate a list of non-adopted articles to compare with the adopted articles. From the list of adopted articles, I will record the title of the publication and the publication issue. From each journal and issue that contained the adopted article, I will select a random article that was not adopted and code it as non-adopted for this investigation. I will also code the innovation characteristic of each of the non-adopted articles.

I will combine this list of adopted and not adopted articles into one database and I will code the treatment of both adopted and non-adopted articles. The treatment coding for the articles will be binary: 1 – adopted, 0 – non-adopted. I will perform logistic regression using the covariates and control variables. Additionally, I will use an ANOVA statistical technique to analyze each covariate variable to determine whether there is a significant difference between the adopted versus not adopted attributes.

Measures of Dependent Variables

Practitioner adoption assesses whether the innovation (i.e., a scholarly article) has been adopted (Rogers, 2010). This study will measure adoption if the target article has been cited in a popular press book. Also, by choosing adoption as the dependent variable, the study will answer the call to fill an empirical gap in the literature (Becker & Gerhart, 1996).

The majority of Diffusion of Innovations studies use instrumentation to measure adoption. However, this project deploys the second most widely used method, secondary data (Tornatzky & Klein, 1982). This study will use citation in popular press books as a proxy for practitioner adoption. Ketchen, Ireland, and Baker (2013) warn that the use of proxies with poor construct measure overlap erodes construct validity. Appropriate proxies must closely align with the theoretical construct they intends to capture (Campbell & Fiske, 1959). I posit that popular press books, as a proxy measure,

overlap substantially with the theoretical construct of practitioner adoption, and therefore maintains construct validity. Ketchen et al. (2013) suggest that researchers employing proxy measures must either 1) demonstrate that the selected proxy was correctly applied in past research, or 2) provide sound logic as to how the theoretical construct and proxy overlap.

With regard to the first criterion, I noted above that this proxy had been robustly applied to a highly related construct in past research (i.e., Pfeffer & Fong, 2002; Lewis, 2006). To satisfy the second criterion, Rogers (1962) defines adoption as a decision to use a new idea. There is no requirement for the adopter to implement the innovation. Implementation is the next step in the diffusion process and is defined as actually using the innovation (Rogers, 2010). So adoption is merely the intention—not the requirement—to actively implement or follow through on the decision. Therefore, adoption is an intention. Individuals have various good intentions daily, like losing weight, eating healthy, and going to the gym. We know that many of these individuals fail to follow through with their good intentions, even after spending money on weight loss programs, nutritional supplements, and gym memberships. So a consumer's purchase decision equates to adoption (Rogers, 1962). This study argues that individuals who purchased business-related popular press books have an intention to use (or adopted) the contents. I acknowledge that the purchaser of the book may not implement (or read) the contents of the book.

Also, if popular press books appear on best seller lists, we know that there were numerous sales of the book. With numerous sales, it is reasonable to argue there is some popularity to the books and multiple individuals intended to read (or adopt) the contents. More importantly, business-related books on best seller lists are more influential than academic books in affecting management practice (Pfeffer & Fong, 2002). Furthermore, prior research acknowledges that managers use popular press books to guide their organizations (Armstrong, 1994). Management-related popular press books are designed for the practitioner. We know this because editors of these books remind their authors that they are writing for managers who are relatively intelligent and can take ideas to work with them (Clark & Greatbatch, 2004). By using this logic, I posit that popular press books provide ample

overlap with the theoretical construct practitioner adoption as outlined by Ketchen et al. (2013) and therefore has construct validity.

Measures of Independent Variables

Relative advantage is the degree to which an innovation appears to be better than the idea it replaces (Roger & Shoemaker, 1971). When measuring relative advantage, direct calculation of the construct is not a viable option, so most researchers infer the construct. Some researchers use an adopters' or judges' rating (Tornatzky & Klein, 1982). In this study, I will infer relative advantage by using the number of academic citations of the target articles garnered at the time of publication for the selected popular press book. This number of citations will be compared to the average citations of the entire sample. (Note, for all calculations of time that require the use of an academic article date, the documented date of first availability will be used.) It is a reasonable argument that an article that garners more citations than the sample average has an advantage over an article that earns less than the sample average.

Compatibility is the degree to which an innovation appears to be consistent with existing values, past experiences, and needs (Rogers et al., 1971). Shapiro et al. (2007) propose that the meaning of scientific knowledge is lost in translation from science to practice. Other scholars suggest that both the scientist and practitioner are seen as experts in their respective domains but laymen to each other (Kieser & Leiner, 2009). As a result, the science-practitioner gap arises from their difficulty in finding "common ground" in the layman-expert communication dyad (Kieser & Leiner, 2009). To assess this, the Flesch–Kincaid grade-level readability scale will be used. This scale determines the required reading level a person must obtain to comprehend the written material. To identify compatibility, a two-step procedure will occur. First, I will measure the Flesch–Kincaid grade level for both the target article and the corresponding popular press book. Then the difference between the two scores will be used to identify compatibility. As the variance between the two scores decreases, the article and popular press are similar in readability and compatibility.

Complexity is the degree to which an innovation is seen as relatively hard to understand and use (Rogers et al., 1971). Researcher argue that the writing style of research and scientific knowledge is too sophisticated (e.g., Leisenring & Johnson, 1994). I will measure complexity by evaluating the theoretical model presented in the academic article. When the academic article is a purely theoretical discovery without empirics, it will be coded as the reference variable. The dummy coding technique will be to code this categorical variable, i.e., theory article = 1000, quantitative = 0100, etc.

Trialability is the degree to which an innovation may be experimented with on a limited basis (Rogers et al., 1971). Sampling or couponing and giving products away free or at a discount are two marketing tactics used to initiate consumer trial. Publishers charge consumers a fee to gain access to their database of scientific knowledge. It's reasonable to argue that if the fee is waived or reduced, the likelihood of consumers reading the scientific knowledge increases. Some academic articles are available online for free. Unpaywall measure the accessibility of academic knowledge at the article level. Unpaywall states whether the article is free to access. As such, trialability will be coded as a binary: 1 – paid access, 0 – free access. Therefore, the cost it takes to gain access to the article will be used to identify trialability.

Observability is the degree to which the results of an innovation are clearly seen (Rogers et al., 1971). The total number of backlinks that redirect to the target article's online webpage will be used to identify observability. A backlink is akin to an online citation for a webpage. A backlink or inbound link is a one-way connection from an external source to the target website. Generally, the more inbound links associated with a webpage, the greater its visibility and importance (Introna & Nissenbaum, 2000). It is reasonable to argue that the more a product (academic knowledge) is used (cited), the more visible to others.

Measures of Moderating Variables

Change Agent (Influence) – Change agents either actively or passively influence the adoption decision. Change agents are influencers, i.e., sales team or publisher, that are external to the adoption community that impacts the adoption process (Turnbull & Meenaghan, 1980). Additionally, we know

that there are varying degrees of popularity among research topics (Yan, 2014). Thus, how the article is categorized or the subject (i.e., law and legal studies, medical and health sciences, management) of the article will be used to measure change agent influence.

Measures of Control Variables

Innovators (Adoption Time) is the time it takes for the innovation to be adopted by the innovator group (Rogers, 2010). The difference in time between the target article's first available date and the first available publication date where the target article received its first citation will be used to identify Innovators (Adoption Time). It is important to control for adoption time as the rate of awareness and adoption will impact the imitator group's awareness and adoption (Rogers, 1962). It is reasonable to argue that the opportunity for awareness increases as the article ages. Furthermore, I will control for the age of the article. It is also reasonable to argue that an older article has a greater likelihood of being adopted than a younger article.

Innovator (Adoption Rate) is the rate in which the innovators adopt the innovation (Rogers, 2010). The average number of yearly citations the article gained between the article creation date and the publication date of the popular press book where the article was cited will be used to identify Innovator (Adoption Rate). Although adoption rate and relative advantage both use the number of citations in its measure, the two constructs are distinct. Adoption rate is measuring the average number of citations garnered by an academic article between two time periods. Relative advantage is comparing target article's average citation count to other articles in the sample. Measuring relative advantage is a vital component in this study, and controlling for adoption rate is equally important as the rate of awareness and adoption will impact the imitator group's awareness and adoption (Rogers, 1962).

Study 2 – Altmetric.com

For the second sample, I will explore articles contained in the Altmetric.com database. Note that Altmetric.com is different than altmetrics. Altmetric.com is a database that tracks the digital footprint of academic research, whereas (lower case) altmetrics is viewed as a way of determining the societal

impact of academic research (Piwowar, 2013). It this study, I look to understand whether the diffusion of innovations characteristics determines the level of societal impact (practitioner adoption). Techniques using altmetrics emphasize social media activity as a tool to measure societal impact (Shema, Bar□Ilan, & Thelwall, 2014). More importantly, altmetrics techniques are useful in determining the impact of research beyond academia (Bornmann, 2014) or what Taylor (2013) calls the hidden impact.

Altmetric (Altmetric.com) is a firm that specializes in the collection of data to use for altmetric activity. Altmetric.com collects and stores web and social media activity on any academic knowledge that has a digital object identifier (Hammarfelt, 2014). This study will examine and analyze articles in the Altmetric.com database to determine the level of practitioner adoption.

At the time of this study, the Altmetric.com database contained data on over 24 million research outputs. This scope of this study will be limited to the articles contained in the following academic journals: *Academy of Management Journal*, *Academy of Management Review*, *Entrepreneurship: Theory & Practice*, *Journal of Applied Psychology*, and *Journal of Business Venturing*. Limiting the scope to the five journals reduces the sample to 6,414 articles.

The innovation attributes of each article will be coded to determine whether the innovation characteristic explains the variance in the level of practitioner adoption. Prior research suggests that altmetrics techniques are useful in determining the impact of research beyond academia (Bornmann, 2014). I seek to understand whether the innovation characteristics are useful in determining the level of practitioner adoption. I use Poisson regression analysis to determine the significance of each of the attributes (covariates).

Measures of Dependent Variables

Practitioner adoption assesses whether the innovation (i.e., a scholarly article) has been adopted (Rogers, 2010). This study will measure adoption if the target article has been Tweeted by a member of the general public. Also, by choosing adoption as the dependent variable, the study will answer the

call to fill an empirical gap in the literature, which is understanding what literature has a greater influence on practice (Becker & Gerhart, 1996).

I will use Twitter data recorded and stored by Altmetric.com as a proxy for practitioner adoption. The Altmetric.com database can make a distinction between members of the general public and scientists. So more precisely, I will examine the Tweets made by the general public. There is no requirement for the adopter to implement the innovation. Implementation is the next step in the diffusion process and is defined as actually using the innovation (Rogers, 2010). So adoption is merely the intention—not the requirement—to actively implement or follow through on the decision. Therefore, adoption is an intention. I argues that when members of the public Tweet about an article, they have an intention to use (or adopt) the contents. It is reasonable to argue that an article with compelling content would encourage the user to make a post-acquisition action by informing others of the significance of the article. Although the threshold for this study is adoption, the act of disseminating information after becoming aware of a product exceeds the required standard.

In addition, by investigating Twitter data, we can evaluate the level of adoption by evaluation the number of Tweets made by members of the public. By using this logic, I posit that Tweets made by members of the public provide ample overlap with the theoretical construct practitioner adoption as outlined by Ketchen et al. (2013).

Measures of Independent Variables

Relative advantage is the degree to which an innovation is seen as being better than the idea it replaces (Roger & Shoemaker, 1971). In measuring relative advantage, most researchers infer the construct, whereas some used an adopters' or judges' rating (Tornatzky & Klein, 1982). In this study, I will infer relative advantage by using the number of academic citations of the target article garnered at the time of publication for the selected popular press book, which will be compared to the average citations of the entire sample. As such, it is evident that an article that garners more citations than the sample average has an advantage over an article that earns less than the sample average.

Compatibility is the degree to which an innovation is seen to be consistent with the existing values, past experiences, and needs of the receivers (Rogers et al., 1971). Shapiro et al. (2007) propose that the meaning of scientific knowledge is lost in translation from science to practice. Other scholars suggest that both the scientist and practitioner are seen as experts in their respective domains but laymen to each other (Kieser & Leiner, 2009). As a result, the science-practitioner gap arises from their difficulty in finding "common ground" in the layman-expert communication dyad (Kieser & Leiner, 2009). To assess this, I will use the Flesch–Kincaid grade level readability scale, which determines the required reading level a person must obtain to comprehend the written material. To identify compatibility, a two-step procedure will occur. First, this study will measure the Flesch–Kincaid grade level for the target article. The target article's Flesch-Kincaid readability score will be compared to the tenth-grade level. The general IRB guideline recommends that informed consent documents have a Flesch-Kincaid grade level of tenth grade or less. It is reasonable to argue that academic articles written closer to a tenth-grade level will be read and adopted more than articles written at higher levels (Paasche-Orlow, Taylor, & Brancati, 2003). The target article's Flesch-Kincaid grade level minus the tenth-grade level score will be used to identify compatibility. As the variance between the two scores decreases, the article is closer to a tenth-grade reading level and more likely to be read and adopted.

Complexity is the degree to which an innovation is seen as hard to understand and use (Rogers et al., 1971). It is argued the writing style of research and scientific knowledge is too sophisticated (e.g., Leisenring & Johnson, 1994). I look to identify the complexity of the writing of scientific knowledge. I will measure complexity by evaluating the theoretical model presenting in the academic article. When the academic article is a purely theoretical discovery without a model, it will be coded as the reference variable. Along with coding the number of constructs, the methodological technique will be coded as a categorical variable, i.e., theory article, quantitative, qualitative, or mixed method.

Trialability is the degree to which an innovation may be "tried out" (Rogers et al., 1971). Sampling or couponing, giving the product away for free or at a discount are two marketing tactics

used to initiate consumer trial. Publishers charge consumers a fee to gain access to their databases of scientific knowledge. It's reasonable to argue that if the fee is waived or reduced, the likelihood of consumers reading the scientific knowledge increases. Some academic articles are available online for free. Unpaywall measures the accessibility of academic knowledge at the article level. Unpaywall states whether the article is free to access. As such trialability will be coded as a binary: 1 – paid access, 0 – free access. Therefore, the cost it takes to gain access to the article will be used to identify trialability.

Observability is the degree to which others can see the results of an innovation (Rogers et al., 1971). The total number of backlinks that redirect to the target article's online webpage will be used to identify observability. A backlink is like an online citation for a webpage. It is reasonable to argue that the more a product (academic knowledge) is used (cited), the more visible to others.

Measures of Moderating Variables

Change Agent (Influence) – Change agents either actively or passively influence the adoption decision. Change agents are influencers, i.e., sales team or publisher, that are external to the adoption community that impacts the adoption process (Turnbull & Meenaghan, 1980). Additionally, it is known that there are varying degrees of popularity among research topics (Yan, 2014). Thus, how the article is categorized or the subject (i.e., law and legal studies, medical and health sciences, management) of the article will be used to measure change agent influence.

Measures of Control Variables

Innovators (Adoption Time) is the time it takes for the innovation to be adopted by the innovator group (Rogers, 2010). It is important to control for adoption time as the rate of awareness and adoption will impact the imitator group's awareness and adoption (Rogers, 1962). It is reasonable to argue that the opportunity for awareness increases as the article ages.

Furthermore, I will control for the age of the article. It is reasonable to argue that an older article has a greater likelihood to be adopted than a younger article. Innovator (Adoption Rate) is the rate in which the innovators adopt the innovation (Rogers, 2010). It is important to control for adoption rate

as the rate of awareness and adoption will impact the imitator group's awareness and adoption (Rogers, 1962).

CHAPTER IV

RESULTS

Overview

In Chapter II, it was argued and supported by theoretical literature that academic knowledge is an innovation, and the adoption of an innovation is impacted by its diffusion of innovation characteristics (Rogers, 1962). In Chapter III, a theoretically based plan was put forth on how to empirically test the two questions: 1) Can the innovation characteristics of academic knowledge be used to predict whether that knowledge is adopted by a practitioner? and 2) Can the innovation characteristics of academic knowledge be used to understand the degree of practitioner adoption?

To answer both research questions, two different studies were performed. In the first study, a set of popular press books was selected from the *New York Times* Best Sellers list. The academic articles cited by the selected popular press books were the target for this first study. The study consisted of academic articles drawn from the Altmetric.com API. In this chapter, the results of examining those articles are presented. To present and explain the outcomes of the studies in an effective manner, the results of Study 1 (*New York Times* Best Sellers List) will be presented first, followed by the results of Study 2 (Altmetric.com API). For each study, the descriptive statistics will be presented and discussed first. Second, a discussion of steps taken to analyze the data is presented. Next, to answer the research questions, the main effects of the analysis are presented,

followed by an examination of the hypothesis results. After the main effects, the moderation effects are examined along with a discussion of the hypothesis results.

Study 1 – *New York Times* Best Sellers List

McMahon and Orr (2017) explored evidence-based practices in organization settings by examining five popular press books listed on the *New York Times* Best Sellers List. Their work looked to understand how readers of business popular press books perceived the claims made by their authors. McMahon and Orr (2017) examined the following books: (1) *Lean In* (Sandberg, 2013), (2) *Outliers* (Gladwell, 2008), (3) *Thinking, Fast and Slow* (Kahneman, 2011), (4) *The Power of Habit* (Duhigg, 2012), and (5) *#GIRLBOSS* (Amoruso, 2014). This study examined the academic articles cited in four of the five books, excluding *#GIRLBOSS* (Amoruso, 2014) as it did not contain any academic articles. *#GIRLBOSS* (Amoruso, 2014) was replaced with the randomly selected popular press book, *When: The Scientific Secrets of Perfect Timing* (Pink, 2018). The innovation characteristics of each of the academic articles found in the first and last chapter of each of the selected books were coded. Additionally, a matching not adopted (by popular press article) was selected, and innovation characteristics were coded.

The descriptive statistics and correlations are associated with practitioner adoption and the academic article innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability. Both complexity and trialability are categorical variables. The complexity variable had six categories (theory, quantitative, qualitative, mixed methods, review, and meta-analyses) and was dummy coded with theory articles serving as the reference, whereas trialability is binary and was coded as such. In addition to the independent and dependent variables, three control variables were included in the analysis: the age of the academic article, the time (measured in years) between the publication of the target academic article and the citing popular press book, and the time between the publication of the target article and the first citation the target article earned.

The descriptive statistics and correlations for all the variables used in the test are presented in Tables 5 and 6, respectively. Specifically, Pearson's correlation was used to identify significant

correlations. The results show that both relative advantage and change agent influence are significantly correlated to practitioner adoption. One noticeable relationship is that complexity (quantitative articles) was significantly correlated with numerous variables relative advantage and all other complexity measures. Also noteworthy is that the age of the article was significantly correlated with all variables except observability and practitioner adoption.

To answer the research questions, a binomial logistic regression was performed to ascertain the effects of relative advantage, compatibility, complexity, trialability, and observability on the likelihood that academic articles are adopted by practitioners. The linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure. A Bonferroni correction was applied using all terms in the model resulting in statistical significance being accepted when $p < .004$ (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable.

Tables 5: Descriptive Statistics

	Mean	Std. Deviation	N
Time_Innovators	9.737269721	9.348513070	406
Time_Imitators	1.211755179	2.390281733	406
Time_AoA	11.79727377	9.314806017	406
RelativeAdvantage	.0000000000	441.9401757	406
Compatibility	7.334162562	3.726975536	406
Theory	.11	.311	406
Quantitative	.69	.462	406
Qualitative	.02	.139	406
MixedMethods	.01	.086	406
Review	.15	.360	406
MetaAnalyses	.02	.139	406
Trialability	.30	.459	406
Observability	114.21	258.522	406
ChangeAgentInfluence	.41	.493	406
Adoption	.50	.501	406

Table 6: Correlations

		Time_Innovators	Time_Imitators	Time_AoA	RelativeAdvantage	Compatibility	Theory	Quantitative	Qualitative	MixedMethods	Review	MetaAnalyses	Trialability	Observability	ChangeAgentInfluence	Adoption
Time_Innovators	Pearson Correlation	1	.362**	.956**	.299**	-.163**	-.059	-.066	.020	-.041	.139**	-.004	-.207**	-.053	-.053	.006
	Sig. (2-tailed)		.000	.000	.000	.001	.233	.185	.690	.412	.005	.940	.000	.291	.287	.908
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Time_Imitators	Pearson Correlation	.362**	1	.359**	-.052	-.056	-.037	.016	.023	-.027	.021	-.031	-.108*	-.090	-.046	-.085
	Sig. (2-tailed)	.000		.000	.300	.257	.454	.746	.645	.592	.674	.534	.029	.069	.358	.086
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Time_AoA	Pearson Correlation	.956**	.359**	1	.291**	-.142**	-.012	-.141**	.033	-.029	.192**	-.017	-.197**	-.034	-.119*	.006
	Sig. (2-tailed)	.000	.000		.000	.004	.816	.004	.513	.557	.000	.726	.000	.491	.016	.908
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
RelativeAdvantage	Pearson Correlation	.299**	-.052	.291**	1	.033	.041	-.160**	-.053	-.015	.155**	.099*	-.018	.490**	.000	.264**
	Sig. (2-tailed)	.000	.300	.000		.503	.408	.001	.288	.756	.002	.046	.723	.000	.998	.000
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Compatibility	Pearson Correlation	-.163**	-.056	-.142**	.033	1	.013	-.060	.058	.019	.060	-.053	.021	.057	.015	-.036
	Sig. (2-tailed)	.001	.257	.004	.503		.799	.227	.241	.697	.231	.284	.674	.251	.762	.469
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Theory	Pearson Correlation	-.059	-.037	-.012	.041	.013	1	-.523**	-.049	-.030	-.148**	-.049	-.004	.102*	-.019	.048
	Sig. (2-tailed)	.233	.454	.816	.408	.799		.000	.320	.546	.003	.320	.939	.041	.696	.339
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Quantitative	Pearson Correlation	-.066	.016	-.141**	-.160**	-.060	-.523**	1	-.213**	-.129**	-.637**	-.213**	.053	-.258**	.051	.037
	Sig. (2-tailed)	.185	.746	.004	.001	.227	.000		.000	.009	.000	.000	.286	.000	.304	.453
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Qualitative	Pearson Correlation	.020	.023	.033	-.053	.058	-.049	-.213**	1	-.012	-.060	-.020	-.016	-.054	-.047	.000
	Sig. (2-tailed)	.690	.645	.513	.288	.241	.320	.000		.806	.226	.686	.754	.278	.343	1.000
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
MixedMethods	Pearson Correlation	-.041	-.027	-.029	-.015	.019	-.030	-.129**	-.012	1	-.037	-.012	.069	.021	-.014	-.086
	Sig. (2-tailed)	.412	.592	.557	.756	.697	.546	.009	.806		.462	.806	.166	.677	.777	.082
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Review	Pearson Correlation	.139**	.021	.192**	.155**	.060	-.148**	-.637**	-.060	-.037	1	-.060	-.084	.244**	-.065	-.082
	Sig. (2-tailed)	.005	.674	.000	.002	.231	.003	.000	.226	.462		.226	.091	.000	.193	.098
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
MetaAnalyses	Pearson Correlation	-.004	-.031	-.017	.099*	-.053	-.049	-.213**	-.020	-.012	-.060	1	.023	.039	.097	.035
	Sig. (2-tailed)	.940	.534	.726	.046	.284	.320	.000	.686	.806	.226		.643	.437	.051	.476
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Trialability	Pearson Correlation	-.207**	-.108*	-.197**	-.018	.021	-.004	.053	-.016	.069	-.084	.023	1	.065	-.016	.043
	Sig. (2-tailed)	.000	.029	.000	.723	.674	.939	.286	.754	.166	.091	.643		.194	.745	.388
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Observability	Pearson Correlation	-.053	-.090	-.034	.490**	.057	.102*	-.258**	-.054	.021	.244**	.039	.065	1	.110*	.088
	Sig. (2-tailed)	.291	.069	.491	.000	.251	.041	.000	.278	.677	.000	.437	.194		.027	.076
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
ChangeAgentInfluence	Pearson Correlation	-.053	-.046	-.119*	.000	.015	-.019	.051	-.047	-.014	-.065	.097	-.016	.110*	1	.140**
	Sig. (2-tailed)	.287	.358	.016	.998	.762	.696	.304	.343	.777	.193	.051	.745	.027		.005
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406
Adoption	Pearson Correlation	.006	-.085	.006	.264**	-.036	.048	.037	.000	-.086	-.082	.035	.043	.088	.140**	1
	Sig. (2-tailed)	.908	.086	.908	.000	.469	.339	.453	1.000	.082	.098	.476	.388	.076	.005	
	N	406	406	406	406	406	406	406	406	406	406	406	406	406	406	406

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Study 1 – Control Variables

Innovators (Adoption Time) is the time it takes for the innovation to be adopted by the innovator group (Rogers, 2010). This study argued that it is important to control for adoption time as the rate of awareness and adoption will impact the imitator group's awareness and adoption (Rogers, 1962). It is reasonable to argue that the opportunity for awareness increases as the article ages. It is reasonable to argue that an older article has a greater likelihood to be adopted than a younger article. In Study 1, the statistical results of the control variables (innovator's time, imitator's time, and age of article) are found in Table 7. None of the control variables was found to be statically significant.

Table 7: Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Time_Innovators	.004	.037	.014	1	.904	1.004	.935	1.079
	Time_Imitators	-.100	.057	3.059	1	.080	.905	.809	1.012
	Time_AoA	.004	.037	.015	1	.902	1.005	.935	1.079
	Constant	.021	.178	.014	1	.904	1.022		

a. Variable(s) entered on step 1: Time_Innovators, Time_Imitators, Time_AoA.

Study 1 - Main Effects

The logistic regression model was statistically significant, $\chi^2(9) = 65.404$, $p < .0005$. The model explained 19.8% (Nagelkerke R^2) of the variance in practitioner adoption (Table 8). Note, Nagelkerke R^2 approximates the ordinary least squares R^2, as logit regression uses maximum likelihood estimation (Smith & McKenna, 2013). Additionally, a Hosmer and Lemeshow goodness of fit test was performed to determine how poorly the model is at predicting outcomes. The Hosmer and Lemeshow test is not statistically significant ($p = 0.104$), indicating that the model is not a poor fit (Table 9).

Table 8: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	497.432[a]	.149	.198

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

Table 9: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13.247	8	.104

The model correctly classified 67.2% of cases. Sensitivity was 52.2%, specificity was 82.3%, positive predictive value was 74.6%, and the negative predictive value was 63.3% (Table 10). Of the five predictor variables, only one was statistically significant: relative advantage (as shown in Table 11). It is understood that the β coefficients in a regression equation are used to predict results in the dependent variable (adoption). However, for logistic (binary) regression, the β coefficients do not provide intuitive results. As such, we look at the Exp(β), which translates the β into a meaningful statistic. In the case of relative advantage, the Exp(β) = 1.004. So as the relative advantage of the article increases by one unit, the odds for adoption increases by a factor of (1/1.004) = 1.0.

Table 10. Classification Table

			Predicted		
			Adoption		Percentage Correct
	Observed		Not Adopted	Adopted	
Step 1	Adoption	Not Adopted	167	36	82.3
		Adopted	97	106	52.2
	Overall Percentage				67.2

a. The cut value is .500

Table 11. Variables in the Equation

								95% C.I.for EXP(B)	
		B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Step 1[a]	RelativeAdvantage	.004	.001	23.138	1	.000	1.004	1.002	1.006
	Compatibility	-.015	.029	.261	1	.609	.985	.930	1.043
	Quantitative	.007	.358	.000	1	.984	1.007	.499	2.033
	Qualitative	.275	.789	.122	1	.727	1.317	.280	6.186
	MixedMethods	-21.368	22934.251	.000	1	.999	.000	.000	.
	Review	-.864	.454	3.623	1	.057	.422	.173	1.026
	MetaAnalyses	-.207	.890	.054	1	.816	.813	.142	4.650
	Trialability	.254	.235	1.168	1	.280	1.290	.813	2.045
	Observability	-.001	.001	1.267	1	.260	.999	.998	1.000
	Constant	.487	.417	1.363	1	.243	1.627		

a. Variable(s) entered on step 1: RelativeAdvantage, Compatibility, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability.

Study 1 - Main Effects with Moderation

The logistic regression model was statistically significant, $\chi^2(18) = 79.7$, $p < .0005$. The model explained 23.8% (Nagelkerke R^2) of the variance in practitioner adoption (Table 12). Additionally, a Hosmer and Lemeshow goodness of fit test was performed to determine how poorly the model is at predicting outcomes. The Hosmer and Lemeshow test is not statistically significant ($p = 0.06$), indicating that the model is not a poor fit (Table 14).

Table 12: Study 1 Main Effects Hypothesis Testing

Hypothesis 1: As the relative advantage of scientific knowledge improves over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Supported**: relative advantage, *p*-value < .05.
Hypothesis 2: As the perceived compatibility of scientific knowledge is congruent with the adoption community's beliefs, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Not Supported**: compatibility, *p*-value > .05.
Hypothesis 3: As the perceived complexity of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators decreases.	**Not Supported**: complexity, *p*-value > .05.
Hypothesis 4: As the perceived trialability of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Not Supported**: trialability, *p*-value > .05.
Hypothesis 5: As the perceived observability of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Not Supported**: observability, *p*-value > .05.

Table 13: Model Summary/Omnibus Test of Model Coefficients

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	483.170[a]	.178	.238

a. Estimation terminated at iteration number 20 because maximum iterations has been reached. Final solution cannot be found.

		Chi-square	df	Sig.
Step 1	Step	65.404	9	.000
	Block	65.404	9	.000
	Model	65.404	9	.000

Table 14: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	15.212	8	.055

The model correctly classified 66.7% of cases. Sensitivity was 52.2%, specificity was 81.3%, positive predictive value was 73.6%, and the negative predictive value was 63.0% (Table 15). Of the five predictor variables, only two were statistically significant: relative advantage and review (as

shown in Table 16). None of the variables that interacted with the moderating term was statistically significant.

Table 15: Classification Table

Observed			Predicted Adoption		
			Not Adopted	Adopted	Percentage Correct
Step 1	Adoption	Not Adopted	165	38	81.3
		Adopted	97	106	52.2
	Overall Percentage				66.7

a. The cut value is .500

Table 16: Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	RelativeAdvantage	.003	.001	13.711	1	.000	1.003	1.002	1.005
	Compatibility	-.039	.037	1.136	1	.286	.962	.895	1.033
	Quantitative	-.208	.401	.268	1	.604	.812	.370	1.784
	Qualitative	.286	.906	.100	1	.752	1.331	.225	7.868
	MixedMethods	-21.010	28410.233	.000	1	.999	.000	.000	.
	Review	-1.196	.550	4.735	1	.030	.302	.103	.888
	MetaAnalyses	20.834	28207.813	.000	1	.999	1116923409	.000	.
	Trialability	.216	.303	.509	1	.476	1.242	.685	2.250
	Observability	.000	.001	.241	1	.623	1.000	.998	1.001
	ChangeAgentInfluence by RelativeAdvantage	.003	.002	1.895	1	.169	1.003	.999	1.007
	ChangeAgentInfluence by Compatibility	.064	.058	1.231	1	.267	1.067	.952	1.195
	ChangeAgentInfluence by Quantitative	.413	.506	.665	1	.415	1.511	.560	4.076
	ChangeAgentInfluence by Qualitative	-.110	1.752	.004	1	.950	.896	.029	27.744
	ChangeAgentInfluence by MixedMethods	-1.341	49220.079	.000	1	1.000	.262	.000	.
	ChangeAgentInfluence by Review	.869	.794	1.198	1	.274	2.384	.503	11.303
	ChangeAgentInfluence by MetaAnalyses	-22.151	28207.813	.000	1	.999	.000	.000	.
	ChangeAgentInfluence by Trialability	.217	.499	.189	1	.664	1.242	.467	3.300
	ChangeAgentInfluence by Observability	-.001	.001	.745	1	.388	.999	.997	1.001
	Constant	.530	.435	1.485	1	.223	1.699		

a. Variable(s) entered on step 1: RelativeAdvantage, Compatibility, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability, ChangeAgentInfluence * RelativeAdvantage , ChangeAgentInfluence * Compatibility , ChangeAgentInfluence * Quantitative , ChangeAgentInfluence * Qualitative , ChangeAgentInfluence * MixedMethods , ChangeAgentInfluence * Review , ChangeAgentInfluence * MetaAnalyses , ChangeAgentInfluence * Trialability , ChangeAgentInfluence * Observability .

Table 17: Study 1 Main Effects with Moderator Interaction Hypothesis Testing

Hypothesis 6: The relationship between the innovation characteristic of scientific knowledge and imitator's adoption is impacted by change agent influence, such that as the influence of the change agent increases, the likelihood the scientific knowledge is adopted by the imitators increases.	**Not Supported**: Change Agent, *p*-value > .05.

Study 2 – Altmetric.com

At the time of this study, the Altmetric.com API was tracking over 24.9 million publications. Due to the applied nature of both Management (Whitley, 1984) and Entrepreneurial Research (Shane & Venkataraman, 2000), this study focus was limited to five academic journals: *Journal of Applied Psychology*, *Academy of Management Journal*, *Academy of Management Review*, *Entrepreneurship: Theory & Practice*, and *Journal of Business Venturing*. From the selected journals, 6,257 articles were being tracked in the Altmetric.com API. From those five journals, a random sample of 567 articles was investigated in this study. The innovation characteristics of each of the selected academic articles were coded.

The descriptive statistics and correlations are associated with practitioner adoption and the academic article innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability. Both complexity and trialability are categorical variables. The complexity variable had six categories (theory, quantitative, qualitative, mixed methods, review, and meta-analyses) and was dummy coded with Theory Articles serving as the reference whereas trialability is binary and was coded as such. In addition to the independent and dependent variables, two control variables were included in the analysis. The two control variables were the age of the academic article and the time between the publication date of the target article and the first citation the target article earned.

The descriptive statistics and correlations for all the variables used in the test are presented in Tables 18 and 19, respectively. Specifically, Pearson's correlation was used to identify significant correlations. The results show numerous significantly correlated relationships among the independent, dependent, and control variables.

However, to answer the research questions for this study, Poisson regression was performed. In the Altmetric.com sample, practitioner adoption was measured by the number of Tweets the target academic article generated by members of the general public. A review of the dataset showed that the number of Tweets articles received were dominated by zero. As such, the Tweet data was treated as

count data with a low base rate. Data that is considered count data and dominated with many zeros should be modeled with equations that assume a Poisson distribution (Papoulis, 1984).

Table 18: Descriptive Statistics

	Mean	Std. Deviation	N
RelativeAdvantage	.0000000000	242.9118804	567
Compatability	7.349911817	3.606589350	567
Theory	.13	.337	567
Quantitative	.25	.432	567
Qualitative	.14	.348	567
MixedMethods	.07	.253	567
Review	.22	.416	567
MetaAnalyses	.19	.393	567
Trialability	.11	.319	567
Observability	86.48	546.175	567
PsychologySocialSciences	.46	.499	567
SocialSciencesBusinessManagementandAccountingEconomicsEconometri	.06	.231	567
SocialSciencesBusinessManagementandAccounting	.49	.500	567
TimeInnovator	1.024866750	9.756941723	550
TimeAoA	13.33728588	12.46732573	567
Twitter	2.14	9.965	567

Study 2 – Control Variables

Innovators (Adoption Time) is the time it takes for the innovation to be adopted by the innovator group (Rogers, 2010). It is reasonable to argue that the opportunity for awareness increases as the article ages. It is reasonable to argue that an older article has a greater likelihood to be adopted than a younger article. In Study 2, the statistical results of the control variables (innovator's time and age of article) are found in Table 20.

Table 19: Correlations

		RelativeAdvantage	Compatability	Theory	Quantitative	Qualitative	MixedMethods	Review	MetaAnalyses	Trialability	Observability	PsychologySocialSciences	SocialSciencesBusinessManagementandAccountingEconomicsEconometri	SocialSciencesBusinessManagementandAccounting	TimeInnovator	TimeAoA	Twitter
RelativeAdvantage	Pearson Correlation	1	-.015	-.027	-.132**	-.048	-.049	.021	.221**	-.002	.108**	.071	.009	-.075	.026	.210**	-.016
	Sig. (2-tailed)		.724	.516	.002	.250	.241	.623	.000	.955	.010	.091	.824	.074	.537	.000	.699
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Compatability	Pearson Correlation	-.015	1	.037	-.096*	.059	.041	-.056	.055	.051	.070	.042	.033	-.057	-.052	-.132**	.021
	Sig. (2-tailed)	.724		.384	.022	.163	.329	.180	.189	.226	.097	.318	.435	.175	.228	.002	.626
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Theory	Pearson Correlation	-.027	.037	1	-.222**	-.157**	-.105*	-.207**	-.188**	-.008	.031	-.313**	.064	.283**	-.080	-.131**	-.027
	Sig. (2-tailed)	.516	.384		.000	.000	.012	.000	.000	.850	.461	.000	.128	.000	.062	.002	.521
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Quantitative	Pearson Correlation	-.132**	-.096*	-.222**	1	-.232**	-.156**	-.306**	-.278**	-.013	-.056	.353**	-.122**	-.296**	.013	.151**	-.050
	Sig. (2-tailed)	.002	.022	.000		.000	.000	.000	.000	.749	.183	.000	.004	.000	.767	.000	.235
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Qualitative	Pearson Correlation	-.048	.059	-.157**	-.232**	1	-.110**	-.217**	-.197**	-.003	-.018	-.209**	.098*	.163**	.021	-.189**	.001
	Sig. (2-tailed)	.250	.163	.000	.000		.009	.000	.000	.948	.664	.000	.019	.000	.622	.000	.982
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
MixedMethods	Pearson Correlation	-.049	.041	-.105*	-.156**	-.110**	1	-.145**	-.132**	.012	.080	-.067	-.036	.084*	.060	-.001	.024
	Sig. (2-tailed)	.241	.329	.012	.000	.009		.001	.002	.783	.058	.109	.389	.046	.158	.982	.565
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Review	Pearson Correlation	.021	-.056	-.207**	-.306**	-.217**	-.145**	1	-.259**	-.059	-.062	-.243**	.090*	.201**	.014	.189**	-.007
	Sig. (2-tailed)	.623	.180	.000	.000	.000	.001		.000	.159	.139	.000	.032	.000	.749	.000	.859
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
MetaAnalyses	Pearson Correlation	.221**	.055	-.188**	-.278**	-.197**	-.132**	-.259**	1	.079	.066	.367**	-.080	-.329**	-.017	-.085*	.069
	Sig. (2-tailed)	.000	.189	.000	.000	.000	.002	.000		.059	.118	.000	.058	.000	.692	.044	.099
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Trialability	Pearson Correlation	-.002	.051	-.008	-.013	-.003	.012	-.059	.079	1	-.021	.026	.080	-.062	.014	-.159**	.185**
	Sig. (2-tailed)	.955	.226	.850	.749	.948	.783	.159	.059		.618	.542	.057	.137	.742	.000	.000
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Observability	Pearson Correlation	.108**	.070	.031	-.056	-.018	.080	-.062	.066	-.021	1	.029	-.022	-.018	.004	-.039	.034
	Sig. (2-tailed)	.010	.097	.461	.183	.664	.058	.139	.118	.618		.496	.598	.664	.927	.357	.416
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
PsychologySocialSciences	Pearson Correlation	.071	.042	-.313**	.353**	-.209**	-.067	-.243**	.367**	.026	.029	1	-.224**	-.893**	.060	.093*	.054
	Sig. (2-tailed)	.091	.310	.000	.000	.000	.109	.000	.000	.542	.496		.000	.000	.163	.027	.199
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
SocialSciencesBusinessManagementandAccountingEconomicsEconometri	Pearson Correlation	.009	.033	.064	-.122**	.098*	-.036	.090*	-.080	.080	-.022	-.224**	1	-.238**	.008	-.108*	-.015
	Sig. (2-tailed)	.824	.435	.128	.004	.019	.389	.032	.058	.057	.598	.000		.000	.848	.010	.723
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
SocialSciencesBusinessManagementandAccounting	Pearson Correlation	-.075	-.057	.283**	-.296**	.163**	.084*	.201**	-.329**	-.062	-.018	-.893**	-.238**	1	-.063	-.043	-.047
	Sig. (2-tailed)	.074	.175	.000	.000	.000	.046	.000	.000	.137	.664	.000	.000		.139	.311	.264
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
TimeInnovator	Pearson Correlation	.026	-.052	-.080	.013	.021	.060	.014	-.017	.014	.004	.060	.008	-.063	1	.192**	-.021
	Sig. (2-tailed)	.537	.228	.062	.767	.622	.158	.749	.692	.742	.927	.163	.848	.139		.000	.626
	N	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
TimeAoA	Pearson Correlation	.210**	-.132**	-.131**	.151**	-.189**	-.001	.189**	-.085*	-.159**	-.039	.093*	-.108*	-.043	.192**	1	-.138**
	Sig. (2-tailed)	.000	.002	.002	.000	.000	.982	.000	.044	.000	.357	.027	.010	.311	.000		.001
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567
Twitter	Pearson Correlation	-.016	.021	-.027	-.050	.001	.024	-.007	.069	.185**	.034	.054	-.015	-.047	-.021	-.138**	1
	Sig. (2-tailed)	.699	.626	.521	.235	.982	.565	.859	.099	.000	.416	.199	.723	.264	.626	.001	
	N	567	567	567	567	567	567	567	567	567	567	567	567	567	550	567	567

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 20: Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	1.727	.0415	1.646	1.809	1733.560	1	.000	5.625	5.186	6.101
TimeInnovator	.002	.0024	-.002	.007	.850	1	.357	1.002	.998	1.007
TimeAoA	-.116	.0054	-.126	-.105	454.718	1	.000	.891	.881	.900
(Scale)	1[a]									

Dependent Variable: Twitter
Model: (Intercept), TimeInnovator, TimeAoA

a. Fixed at the displayed value.

In study 2, the age of article was significant (p-value < 0.000) with an Exp(β) = 0.891. This finding suggests that as time increases (age of the article), there will be 10.9% fewer Tweets. On the surface, this finding is counter-intuitive, as theory suggests that as time increases, adoption increases (Rogers, 1962). However, the Altmetric.com database only contains articles published after 2010. Additionally, Twitter did not come into existence until March 2006 (Aal, Parmar, Patel, & Sen, 2014) and number of active users have exponentially increased over time. So, newly published articles reap the benefit of a larger Twitter user base.

Study 2 – Main Effects

A Poisson regression was run to predict the number of Tweets an academic article received based on the relative advantage, compatibility, complexity, trialability, and observability of the academic article. From the model information output (Table 21), I confirm that the dependent variable is the "Number of Tweets," the probability distribution is "Poisson," and the link function is the natural logarithm. Additionally, there is no missing data as the entire sample was included in the analysis (Table 22).

Table 21: Model Information

Dependent Variable	Twitter
Probability Distribution	Poisson
Link Function	Log

Table 22: Case Processing Summary

	N	Percent
Included	567	100.0%
Excluded	0	0.0%
Total	567	100.0%

To have a good fitting model, there is an assumption when performing a Poisson regression: the mean and variance of the covariates are equal. Relative advantage, compatibility, and observability violate this assumption as the ratio between their means and variances are 0.0, 0.57, and 0.00, respectively (These calculations are derived from Table 23). From the goodness of fit analysis (Table 24), we find the Pearson χ^2 Value/df is 18.076, which is an indication of overdispersion. However, the

Omnibus Test (Table 25) indicates the model with all the covariates included is statistically significant ($p = 0.00$) and a better model than the intercept-only model.

Table 23: Continuous Variable Information

		N	Minimum	Maximum	Mean	Std. Deviation
Dependent Variable	Twitter	567	0	157	2.14	9.965
Covariate	RelativeAdvantage	567	-149.188713	1953.811287	.0000000000	242.9118804
	Compatability	567	-.900000000	55.70000000	7.349911817	3.606589350
	Quantitative	567	0	1	.25	.432
	Qualitative	567	0	1	.14	.348
	MixedMethods	567	0	1	.07	.253
	Review	567	0	1	.22	.416
	MetaAnalyses	567	0	1	.19	.393
	Trialability	567	0	1	.11	.319
	Observability	567	0	8527	86.48	546.175

Table 24: Goodness of Fit[a]

	Value	df	Value/df
Deviance	3808.879	557	6.838
Scaled Deviance	3808.879	557	
Pearson Chi-Square	10068.489	557	18.076
Scaled Pearson Chi-Square	10068.489	557	
Log Likelihood[b]	-2256.823		
Akaike's Information Criterion (AIC)	4533.645		
Finite Sample Corrected AIC (AICC)	4534.041		
Bayesian Information Criterion (BIC)	4577.049		
Consistent AIC (CAIC)	4587.049		

Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability

a. Information criteria are in smaller-is-better form.

b. The full log likelihood function is displayed and used in computing information criteria.

Table 25: Omnibus Test[a]

Likelihood Ratio Chi-Square	df	Sig.
788.965	9	.000

Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability

a. Compares the fitted model against the intercept-only model.

With a statistically significant model, the investigation turns to the parameter estimates (Table 26). Of the five predictor variables, four were statistically significant: relative advantage, complexity (qualitative, mixed methods, review, meta-analyses articles), trialability, and observability (as shown in Table 27). Similar to the logistic regression, in Poisson regression, the Exp(β) are used to interpret the results. Although Relative Advantage (*p*-value = 0.00) and observability (*p*-value = 0.00) were significant, their Exp(β) were 0.999 and 1.000, respectively. These findings indicate that these two significant variables (relative advantage and observability) will have little impact on the number of Tweets made by members of the general public. However, a qualitative article will have 1.466 (95% CI, 1.151 to 1.868) more Tweets than a theory article. Similarly, a mixed method article will have 1.840 (95% CI, 1.414 to 1.2.395) more Tweets than a theory article. Additionally, a review article will have 1.547 (95% CI, 1.233 to 1.942) more Tweets than a theory article, whereas a meta-analysis article will have 2.349 (95% CI, 1.890 to 2.919) more Tweets than a theory article. Finally, we find if there is open access to an academic article, it will have 4.729 (95% CI, 4.204 to 5.318) times more Tweets than an article that is closed.

Table 26: Test of Model Effects

Source	Type III Wald Chi-Square	df	Sig.
(Intercept)	.087	1	.768
RelativeAdvantage	26.592	1	.000
Compatability	.023	1	.879
Quantitative	1.020	1	.313
Qualitative	9.610	1	.002
MixedMethods	20.588	1	.000
Review	14.175	1	.000
MetaAnalyses	59.306	1	.000
Trialability	671.077	1	.000
Observability	39.760	1	.000

Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability

Table 27: Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	df	Sig.		Lower	Upper
(Intercept)	-.035	.1177	-.265	.196	.087	1	.768	.966	.767	1.216
RelativeAdvantage	-.001	.0002	-.001	.000	26.592	1	.000	.999	.999	1.000
Compatability	.001	.0085	-.015	.018	.023	1	.879	1.001	.985	1.018
Quantitative	-.124	.1229	-.365	.117	1.020	1	.313	.883	.694	1.124
Qualitative	.383	.1235	.141	.625	9.610	1	.002	1.466	1.151	1.868
MixedMethods	.610	.1344	.346	.873	20.588	1	.000	1.840	1.414	2.395
Review	.436	.1159	.209	.664	14.175	1	.000	1.547	1.233	1.942
MetaAnalyses	.854	.1109	.637	1.071	59.306	1	.000	2.349	1.890	2.919
Trialability	1.554	.0600	1.436	1.671	671.077	1	.000	4.729	4.204	5.318
Observability	.000	3.0931E-5	.000	.000	39.760	1	.000	1.000	1.000	1.000
(Scale)	1[a]									

Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability

a. Fixed at the displayed value.

Study 2 - Main Effects with Moderation

To test the hypothesis with the change agent moderation, A Poisson regression was run to predict the number of Tweets an academic article received based on the relative advantage, compatibility, complexity, trialability, observability, and the interaction term (moderator) change agent influence of the academic article. From the model information output (Table 29) we confirm that the dependent variable is the "number of Tweets," the probability distribution is "Poisson," and the link function is the natural logarithm when the interaction term is included. Additionally, there is no missing data as the entire sample was included in the analysis (Table 30).

To have a good fitting model, there is an assumption when performing a Poisson regression that the mean and variance of the covariates are equal. Relative advantage, compatibility, and observability violate this assumption as the ratio between their means and variances are 0.0, 0.57, and 0.00, respectively (These calculations are derived from Table 31). From the goodness of fit analysis (Table 32), we find the Pearson χ^2 Value/df is 12.713, which is an indication of overdispersion. However, the Omnibus Test (Table 33) indicates the model with all the covariates and moderators included is statistically significant ($p = 0.00$) and a better model than the intercept-only model.

Table 28: Study 2 Main Effects Hypothesis Testing

Hypothesis 1: As the relative advantage of scientific knowledge improves over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Supported**: relative advantage, *p*-value < .05, however the Exp(β) indicates little impact on adoption.
Hypothesis 2: As the perceived compatibility of scientific knowledge is congruent with the adoption community's beliefs, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Not Supported**: compatibility, *p*-value > .05.
Hypothesis 3: As the perceived complexity of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators decreases.	**Supported**: complexity (Qualitative, Mixed Methods, Review, and Meta-Analyses articles supported), *p*-value < .05.
Hypothesis 4: As the perceived trialability of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Supported**: trialability, *p*-value < .05.
Hypothesis 5: As the perceived observability of scientific knowledge increases over the existing body of knowledge, the likelihood that the new scientific knowledge is adopted by the imitators increases.	**Supported**: observability, *p*-value < .05, however the Exp(β) indicates little impact on adoption.

Table 29: Model Information

Dependent Variable	Twitter
Probability Distribution	Poisson
Link Function	Log

Table 30: Case Processing Summary

	N	Percent
Included	567	100.0%
Excluded	0	0.0%
Total	567	100.0%

Table 31: Continuous Variable Information

		N	Minimum	Maximum	Mean	Std. Deviation
Dependent Variable	Twitter	567	0	157	2.14	9.965
Covariate	RelativeAdvantage	567	-149.188713	1953.811287	.0000000000	242.9118804
	Compatability	567	-.900000000	55.70000000	7.349911817	3.606589350
	Quantitative	567	0	1	.25	.432
	Qualitative	567	0	1	.14	.348
	MixedMethods	567	0	1	.07	.253
	Review	567	0	1	.22	.416
	MetaAnalyses	567	0	1	.19	.393
	Trialability	567	0	1	.11	.319
	Observability	567	0	8527	86.48	546.175
	SocialSciencesBusinessManagementandAccountingEconomicsEconometri	567	0	1	.06	.231
	SocialSciencesBusinessManagementandAccounting	567	0	1	.49	.500

Table 32: Goodness of Fit[a]

	Value	df	Value/df
Deviance	3227.442	539	5.988
Scaled Deviance	3227.442	539	
Pearson Chi-Square	6852.236	539	12.713
Scaled Pearson Chi-Square	6852.236	539	
Log Likelihood[b]	-1966.104		
Akaike's Information Criterion (AIC)	3988.208		
Finite Sample Corrected AIC (AICC)	3991.226		
Bayesian Information Criterion (BIC)	4109.738		
Consistent AIC (CAIC)	4137.738		

Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability, RelativeAdvantage
* SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Compatability*
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Quantitative *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Qualitative *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MixedMethods *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Review *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MetaAnalyses *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Trialability *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Observability *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, RelativeAdvantage *
SocialSciencesBusinessManagementandAccounting, Compatability *
SocialSciencesBusinessManagementandAccounting, Quantitative *
SocialSciencesBusinessManagementandAccounting, Qualitative *
SocialSciencesBusinessManagementandAccounting, MixedMethods *
SocialSciencesBusinessManagementandAccounting, Review *
SocialSciencesBusinessManagementandAccounting, MetaAnalyses *
SocialSciencesBusinessManagementandAccounting, Trialability *
SocialSciencesBusinessManagementandAccounting, Observability *
SocialSciencesBusinessManagementandAccounting

Table 33: Omnibus Test[a]

Likelihood Ratio χ^2	df	Sig.
1370.402	27	0.000

Dependent Variable: Twitter Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability, RelativeAdvantage
* SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Compatability*
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Quantitative *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Qualitative *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MixedMethods *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Review*
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MetaAnalyses *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Trialability *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Observability *
SocialSciencesBusinessManagementandAccountingEconomicsEconometri, RelativeAdvantage *
SocialSciencesBusinessManagementandAccounting, Compatability *
SocialSciencesBusinessManagementandAccounting, Quantitative *
SocialSciencesBusinessManagementandAccounting, Qualitative *
SocialSciencesBusinessManagementandAccounting, MixedMethods *
SocialSciencesBusinessManagementandAccounting, Review *
SocialSciencesBusinessManagementandAccounting, MetaAnalyses *
SocialSciencesBusinessManagementandAccounting, Trialability *
SocialSciencesBusinessManagementandAccounting, Observability *
SocialSciencesBusinessManagementandAccounting
a. Compares the fitted model against the intercept-only model.

With a statistically significant model, the investigation turns to the parameter estimates for the moderating variable (change agent influence) (Table 34). The results of the analysis show the various interactions between the main effects and the moderator statistically significant. Like the main effect

test, Poisson regression may result in significant *p*-values. However, the interactions with Exp(β) results close to the one will have little impact on the number of Tweets made by members of the

Table 34: Parameter Estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald χ^2	df	Sig.		Lower	Upper
(Intercept)	0.018	0.1465	-0.269	0.306	0.016	1	0.900	1.019	0.764	1.357
RelativeAdvantage	-0.001	0.0002	-0.001	0.000	9.466	1	0.002	0.999	0.999	1.000
Compatability	-0.012	0.0096	-0.030	0.007	1.478	1	0.224	0.988	0.970	1.007
Quantitative	-0.397	0.1713	-0.733	-0.062	5.381	1	0.020	0.672	0.480	0.940
Qualitative	-0.045	0.2646	-0.563	0.474	0.029	1	0.865	0.956	0.569	1.606
MixedMethods	-0.247	0.2923	-0.820	0.325	0.716	1	0.397	0.781	0.440	1.385
Review	1.556	0.1675	1.228	1.884	86.326	1	0.000	4.741	3.414	6.583
MetaAnalyses	0.577	0.1613	0.261	0.893	12.810	1	0.000	1.781	1.298	2.443
Trialability	2.245	0.0802	2.088	2.402	784.023	1	0.000	9.440	8.067	11.046
Observability	0.000	6.0365E-05	0.000	0.001	48.926	1	0.000	1.000	1.000	1.001
RelativeAdvantage * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-0.003	0.0016	-0.006	0.000	2.930	1	0.087	0.997	0.994	1.000
Compatability * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-0.186	0.0608	-0.305	-0.067	9.364	1	0.002	0.830	0.737	0.935
Quantitative * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-27.779	2796588.0256	-5481239.588	5481184.031	0.000	1	1.000	8.629E-13	0.000	.[a]
Qualitative * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	2.410	0.5436	1.344	3.475	19.649	1	0.000	11.130	3.835	32.300
MixedMethods * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	0.689	1.0909	-1.450	2.827	0.398	1	0.528	1.991	0.235	16.892
Review * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-0.162	0.4205	-0.987	0.662	0.149	1	0.699	0.850	0.373	1.938
MetaAnalyses * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-0.900	1.0448	-2.947	1.148	0.741	1	0.389	0.407	0.052	3.153
Trialability * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	-1.898	0.3424	-2.570	-1.227	30.738	1	0.000	0.150	0.077	0.293
Observability * SocialSciencesBusinessManagementand AccountingEconomicsEconometri	0.001	0.0053	-0.010	0.011	0.025	1	0.873	1.001	0.990	1.011
RelativeAdvantage * SocialSciencesBusinessManagementand Accounting	-0.004	0.0006	-0.005	-0.003	46.652	1	0.000	0.996	0.995	0.997
Compatability * SocialSciencesBusinessManagementand Accounting	-0.014	0.0178	-0.049	0.021	0.620	1	0.431	0.986	0.952	1.021

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald χ^2	df	Sig.		Lower	Upper
Quantitative * SocialSciencesBusinessManagementandAccounting	0.145	0.2264	-0.299	0.589	0.411	1	0.522	1.156	0.742	1.802
Qualitative * SocialSciencesBusinessManagementandAccounting	0.485	0.2746	-0.053	1.023	3.116	1	0.078	1.624	0.948	2.781
MixedMethods * SocialSciencesBusinessManagementandAccounting	1.270	0.3060	0.670	1.869	17.218	1	0.000	3.560	1.954	6.485
Review * SocialSciencesBusinessManagementandAccounting	-2.038	0.1867	-2.404	-1.672	119.124	1	0.000	0.130	0.090	0.188
MetaAnalyses * SocialSciencesBusinessManagementandAccounting	0.193	0.2277	-0.253	0.639	0.720	1	0.396	1.213	0.776	1.895
Trialability * SocialSciencesBusinessManagementandAccounting	-1.593	0.1448	-1.876	-1.309	120.983	1	0.000	0.203	0.153	0.270
Observability * SocialSciencesBusinessManagementandAccounting	0.000	7.3702E-05	0.000	0.000	20.837	1	0.000	1.000	1.000	1.000

“Dependent Variable: Twitter
Model: (Intercept), RelativeAdvantage, Compatability, Quantitative, Qualitative, MixedMethods, Review, MetaAnalyses, Trialability, Observability, RelativeAdvantage * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Compatability * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Quantitative * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Qualitative * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MixedMethods * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Review * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, MetaAnalyses * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Trialability * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, Observability * SocialSciencesBusinessManagementandAccountingEconomicsEconometri, RelativeAdvantage * SocialSciencesBusinessManagementandAccounting, Compatability * SocialSciencesBusinessManagementandAccounting, Quantitative * SocialSciencesBusinessManagementandAccounting, Qualitative * SocialSciencesBusinessManagementandAccounting, MixedMethods * SocialSciencesBusinessManagementandAccounting, Review * SocialSciencesBusinessManagementandAccounting, MetaAnalyses * SocialSciencesBusinessManagementandAccounting, Trialability * SocialSciencesBusinessManagementandAccounting, Observability * SocialSciencesBusinessManagementandAccounting”
a. Set to system missing due to overflow
b. Fixed at the displayed value

general public. The finding showed that a Qualitative Article that falls within the [Social Sciences', 'Business, Management and Accounting', 'Economics, Econometrics and Finance'] field of research have 11.13 (95% CI, 3.84 to 32.30) times more Tweets than a theory article that is in the ['Psychology', 'Social Sciences'] field of research. Similarly, a mixed method article within the ['Social Sciences,' 'Business, Management and Accounting'] field of research will 3.56 (95% CI, 1.95 to 6.48) times more Tweets than a theory article that is in the ['Psychology', 'Social Sciences'] field of research. Additionally, a review article within the ['Social Sciences,' 'Business, Management and Accounting'] field of research will 0.13 (95% CI, 1.95 to 6.48) times fewer Tweets than a theory article that is in the ['Psychology', 'Social Sciences'] field of research.

Table 35: Study 2 Main Effects with Moderator Interaction Hypothesis Testing

Hypothesis 6: The relationship between the innovation characteristic of scientific knowledge and imitator's adoption is impacted by change agent influence, such that as the influence of the change agent increases, the likelihood the scientific knowledge is adopted by the imitators increases.	**Partially Supported**: Change Agent * Compatibility, *p*-value < .05. Change Agent * Qualitative, *p*-value < .05. Change Agent * Mixed Methods, *p*-value < .05. Change Agent * Review, *p*-value < .05. Change Agent * Trialability, *p*-value < .05.

CHAPTER V

DISCUSSION

Discussion

For over 20 years, the science-practice gap—the notion that academic scholars are generating scientific knowledge that is not being implemented in practice—has been a heavily studied phenomenon throughout the academic community (Hambrick, 1994; Weller, 2004; Landers, 2000; Saxe et al., 1988; Harvey & Myers, 1995; Arnold & Hatzopoulos, 2000; Trahan & Gitman, 1995; Sulpizi & Sprik, 2008). However, for the field of management and entrepreneurship, bridging the gap is exceptionally important as the foundation and formation of the field were on the principle of being an applied science (Whitley, 1984; Shane & Venkataraman, 2000). Therefore, this dissertation sought to further understand the gap between science and practice by viewing the issue through the lens of Diffusion of Innovations Theory. Specifically, this study's goal was to address two significant questions: 1) Can the innovation characteristics of academic knowledge be used to predict whether that knowledge is adopted by a practitioner? and 2) Can the innovation characteristics of academic knowledge be used to understand the degree of practitioner adoption? To answer these questions, two studies were explored.

Prior research acknowledges there is a science-practice gap in the field of management (Hambrick, 1994) and numerous other fields of research (Weller, 2004; Landers, 2000; Saxe et al., 1988; Harvey & Myers, 1995; Arnold & Hatzopoulos, 2000; Trahan & Gitman, 199; Sulpizi & Sprik, 2008). Ultimately, scholars who are researching the gap in the various fields want to see

evidence-based or scientific knowledge implemented into practice (Bero et al., 1998). However, these same scholars have compiled various reasons for the gap (Siedl, 2005; Kieser & Leiner, 2009; Van de Ven & Johnson, 2006; Shapiro et al., 2007), and few offer insights on how to bridge the gap (Van de Ven & Johnson, 2006). To answer Hambrick's (1994) call to make management research matter, this study draws upon Roger's Diffusion of Innovation Theory to formulate a model to understand the attributes of the limited scientific knowledge that does impact practice. More importantly, the goal was to provide a framework on how to potentially bridge the science-practice gap.

Research Question 1

The first research question investigated looked to identify the attributes of academic knowledge that will be useful in determining the likelihood of practitioner adoptions. Drawing upon the results of the first study (*New York Times* Best Sellers List), there is some support for the idea that academic article attributes will help determine a practitioner's adoption of knowledge. In the first study, the model was statistically significant. However, of the five academic article attributes measured, only an article's relative advantage was significant. The second study results were more favorable; an article's relative advantage attribute along with its complexity, trialability, and observability was significant or useful in determining the level of practitioner adoption.

Although relative advantage was significant in both samples and observability in the second sample, the effects are minimal. Statistically significant results with negligible effects occur when Exp(β) coefficients values are close to 1.0 (Box & Tidwell, 1962). In the first study, the relative advantage Exp(β) = 1.004, which suggests that while holding everything else constant, one unit increase relative advantage will result in a negligible 0.4% increase in the odds of adoption. However, the complexity and trialability attributes of an academic article have a greater influence on practitioner adoption. Intuitively, academic articles (trialability) open to the general public will more likely impact practitioner adoption. Similarly, qualitative, mixed methods, review, and meta-analysis articles will more likely impact practitioner adoption than theory articles.

Research Question 2

The goal of the second research questions was to understand whether the innovation characteristics of academic knowledge are useful in understanding the level of practitioner adoption. Drawing upon the results of the second study (Altmetic.com API), there was general support for the theory that academic article attributes will help determine the degree of practitioner adoption. Overall, the model was statistically significant. Additionally, four of the five academic article attributes (relative advantage, complexity, trialability, and observability) were significant.

Although relative advantage and observability were significant in Study 2, the effects are minimal. Statistically significant results with negligible effects occurs when Exp(β) coefficients values are close to 1.0 (Box & Tidwell, 1962). However, the complexity and trialability attributes of an academic article have a greater influence on practitioner adoption. Intuitively, academic articles (trialability) open to the general public will more likely impact practitioner adoption. Similarly, qualitative, mixed methods, review, and meta-analysis articles will more likely impact practitioner adoption than theory articles.

External Validity of the Dependent Variable Measures

In combination with this quantitative analysis, this study assessed the external validity of the dependent variable measures: popular press books and Tweets. Morse's (2003) book titled *Handbook of Mixed Methods in Social & Behavioral Research* describes various multimethod designs. For this study, a QUAL + qual multimethod design was used in which the dominant methodology is quantitative focus. However, supplemental qualitative data is collected to enrich the original data.

The goal of this supplemental qualitative analysis was to obtain direct insight from business practitioners to understand what resources they use to find help to solve business-related problems. For example, if a business professional is asked what resources they use to solve a business-related problem, and they answer with, "read a popular press book." Then a reasonable inference would be that popular press books are a resource that practitioners review to solve business-related problems. Furthermore, if the book provides valuable insight, the business practitioner may adopt the contents.

Additionally, the purpose is to understand whether business professionals share the results of their solutions. If a business professional answers in the affirmative when asked if they share solutions to their novel business practices, then there is support that act of sharing relates to adoption.

To gather the supplement data to enrich and assist in validating the dependent variable measures, a broad spectrum of business practitioners was sent a seven open-ended question survey. The survey was sent out to 82 Executive Ph.D. in Business Administration students at a major university. The participants in the program were required to have a master's degree and extensive management experience. A total of 18 surveys was completed through Qualtrics, representing a response rate of 22%. The survey intended to understand what resources business professionals use to solve real-world problems and understand whether they share the results of their solutions. The goal was to look for generalizability and patterns. All of the responses to the survey questions are found in the Appendix. The seven questions asked were as follows:

Question 1: *Take a moment to identify your last significant work-related problem for which you did not have an immediate solution. For the remainder of the survey, use the work-related problem that you have identified to guide your responses. Now, detail the specifics related to this novel work-related problem.*

Question 2: *Where did you turn or what avenues did you take to find solutions for this particular work-related problem?*

Question 3: *Now take a moment to think of the solution(s) you compiled to solve this work-related problem. Please detail the initial solution that you implemented to solve the problem.*

Question 4: *What were your reasons for selecting this solution to implement over the alternatives?*

Question 5: *Did the initial solution solve the work-related issue? If not, where did you turn to next? Did the next solution resolve the problem?*

Question 6: *Since this work-related problem was novel (new), did you share your findings? If so, with whom did you share your findings. What communications tools did you use to share your findings?*

Question 7: *Finally, think about your professional development. List all of the tools, tips, or techniques you used to grow and develop professionally.*

The first question was used to help prime the participants for the second survey question. The goal of the first question was to give the participant time to think of a novel work-related business problem. The intent was for the participant to think of a problem where there was not a predefined solution.

Survey Question 2 was used to understand what resources, tools, and techniques the respondents used to solve novel business-related problems. The respondents stated they used resources both internal (R&D, IT, and legal departments) and external (industry experts and consulting firms) to their organization to find solutions to the problem. Respondents additionally stated they brain-stormed with colleagues, mentors, and customers to find solutions. Most importantly, two respondents reported they read literature and books, and an additional two survey participants used the internet (Google searches) to find solutions. The participants' responses demonstrate that business professionals use a variety of means to solve business-related problems. These responses, particularly from those participants that indicated that they read literature and books, help validate that popular press books are a measure of practitioner adoption.

The purpose of Question 3 was to determine whether a solution was achieved by using the stated resources. The responses were mixed. Most of the respondents did implement some type of solution to the stated problems. Implementation strategies included the full implementation of the solution. Others implemented a partial solution on a trial basis, and some have not implemented any solution. Question 4 was asked to gain insight into why the solution alternative was selected. Responses included, "there were no other alternatives," "it was the safest," "it met the requirements from all

stakeholders…". Other survey participants suggested the selected alternative was the easiest and least expensive.

Question 5 was used to gain an understanding of why the implemented strategy was chosen. Furthermore, the goal was to understand whether an additional search for a solution was needed and if so, what additional resources were used. The responses fell into three broad categories: yes, no, and partially. Only one participant provided information on the additional resources they used. They used Google to search for additional solutions, which again helped validate that business professions seek various means to solve business-related problems.

Question 6 was asked to understand whether business professionals share their solutions to work-related problems. Nearly all the participants that implemented a working solution indicated they shared their finding to their business-related problems. The responses included communication vehicles like seminars, online training, white papers, emails, newsletters, memos, and verbally in company meetings when coaching and mentoring colleagues. This notion that business professionals share solutions to unique business-related problems helps validate that sharing is a critical and perhaps the last step when finding a solution to a novel problem. Although weak, there is support that Tweeted links to academic articles is a measure of practitioner adoption.

Lastly, the goal of Question 7 was to determine what resources business professionals used to develop their skills further. Participating in training, professional development, and university-level and certification classes were among the responses. More importantly, three participants stated that reading relevant books was a means for professional growth. Surprisingly, one participant acknowledged using podcasts and YouTube videos as a method for professional development. Again, this question supports the notion that business professional seeking knowledge will search in various areas. This validates the notion that all available knowledge is consumed for personal growth and helps validated popular press books as a viable measure of practitioner adoption.

The supplementary qualitative data collection provided insight and enriched the overall study. The data collected from the survey suggests that business professionals use a wide variety of

mediums (internet searches to research and development teams) to find solutions to work-related problems. Additionally, the supplementary data suggests that business professionals use both traditional (conferences, trainings, and mentors) and nontraditional (podcast and YouTube videos) educational sources for professional development. The data also suggests that sharing of a finding or solution is part of the last stage in solving work-related. Business professional share finding in various ways, including face-to-face conversations, emails, online, white papers, and meetings. Overall the supplementary data collected from seven open-ended survey questions enriched the study by providing validation for both dependent variable measures (popular press books and Tweets).

The Role of the Practitioner

On the surface, one of the most perplexing findings is the fact that the "relative advantage" hypothesis was the only significant result in both studies. The external validation testing suggested that both dependent variable measures were valid. So it would be reasonable to believe that both dependent variables measured adoption similarly. However, although both measures seem to be valid, there appears to be a difference in the role of the practitioner. In both cases the practitioner sought out information and both were subsequently exposed to academic knowledge. However, the academic knowledge that practitioners received from popular press book authors was filtered. For example, when a practitioner read the book, *When: The Scientific Secrets of Perfect Timing* (Pink, 2019), the practitioner had no choice in the selecting the academic knowledge they read in the book. The author of the book selected the academic knowledge to incorporate in the book. However, in the case of the Altmetric.com study, the role of the practitioner was different. The practitioner selected the academic knowledge and then made a conscience choice to share their findings via a Tweet. This is a power distinction that supports the works of both Lyytinen & Damsgaard (2001) and Leigh Star (2010).

Recall that Lyytined & Damsgaard (2001) suggested that an innovation is not a fixed package and has "interpretive flexibility." As such, the authors of the popular press books selected an article (academic knowledge) to support a claim in the book. It is reasonable to argue that the popular press author selected only the portion of the article needed to support the claim. I posit that this is the

contributing factor as to why the majority of the popular press book hypotheses were not supported. The popular press book filters the academic knowledge that the practitioner receives. From previous research, it is understood that an article (academic knowledge) is more than the sum of its parts (Leigh Star, 2010). Therefore, when only a portion of the innovation (academic knowledge) is presented, the practitioner losses the full impact of the entire contribution made by the academic article author.

In the Altmetric.com study, the role of the practitioner is different. Practitioners selected the articles they Tweeted about, so they had the opportunity to glean more insight from the entire article rather than the snippet provided to the readers of the popular press books. This is an interesting finding for two reasons. One, it supports the view that academic knowledge is lost in translation (Shapiro et al., 2007). Two, it is counter to the idea that academic knowledge is too sophisticated for practitioners (Leisenring & Johnson, 1994). In fact, this finding suggests that academic knowledge has more impact when practitioners consume it unfiltered. From this dissertation's qualitative study, it is understood that practitioners are seeking out solutions for their business-related problems. However, this study suggests that practitioners looking to popular press books for help are looking in the wrong place.

Research Implications

Academic researchers are expected to publish, so much so that the phrase "publish or perish" is top of mind. Publishing is so critical that researchers and universities are both praised and provided additional compensation for noteworthy research articles (McGrail, Rickard, & Jones, 2006). Often these publishing accomplishments have little effect on the practice of management (Hambrick, 1994). It is not a stretch to think that there are still some researchers who believe that the ideal situation is to publish research that will have an impact on practice. However, with such a strong emphasis placed on publishing, it easy for researchers to deemphasize the need to impact practice. This research study provides several implications for those researchers who want to publish and impact practice. The following looks at how this study affects the science-practice gap.

Science-Practice Gap

While the science-practice gap research is plentiful, this study fills a void in the literature. Specifically, this study created a list of keyword search terms that can be used to find all science-practice gap academic articles (see Table 36). Additionally, this study adds to the literature by reviewing and charting (Table 1) all the management-related articles that discuss the science-practice gap.

Table 36: Additional Keyword Search Terms for "Science Practice Gap"

Research Action Gap
Research Adaptation Gap
Research Care Gap
Research Implementation Gap
Research Industry Gap
Research Policy Gap
Research Practice Gap
Research Priority Gap
Science Service Gap
Rigor Relevance Gap
Scholarship Practice Gap
Theory Practice Gap
Know Do Gap

The birth of the science-practice gap in the management field was born out of the need to add methodological rigor to the field (Campbell & Stanley, 1963; Bach, 1966) to put it on par with chemistry and biology. However, it was argued that the methodological rigor in management research grew to a point to where the study results became less useful for solving practical management problems (Susman & Evered, 1978). This study demonstrates that there is a possibility for academic knowledge to have both methodological rigor and impact practice as well. Additionally, there is support to suggest that not all knowledge discovery is the same. Huxley (1881) believed that there is a natural order to scientific discovery: the creation of applied knowledge should follow basic or theoretical knowledge. The results of this study provides support for Huxley's (1881) suggested order of knowledge discovery. Theoretical articles that lack empirics were the least likely to impact practice when compared to articles with empirics, which suggests that theory articles are foundational building blocks that additional research builds. It is the additional research that will ultimately impact practice.

Furthermore, the difference of impact by theoretical articles and other articles answers the query put forth by Banks, Pollack, Bochantin, Kerkman, Whelpley, and O'Boyle (2016). They asked, regardless of impact on practice, if there should be two equally important streams of research: applied and theoretical. The results of this dissertation suggest the answer is affirmative. However, I believe there should be a third, which is quasi-theoretical.

Theoretical knowledge should be indigenous to the field (Cornelissen & Durand, 2014). It should be made for and derived within the boundaries of the scholar's field of study. Creating theoretical knowledge is a difficult task. For the field of management, there are only a few theories that would be classified as theoretical knowledge, e.g., agency and institutional theories (Cornelissen & Durand, 2014). The vast majority of knowledge created would be categorized as quasi-theoretical. It expands the boundaries of theoretical knowledge and may incorporate theories from other disciplines. More importantly, the quasi-theoretical category should provide scholars the freedom to expand the boundaries of both science and practice without having an intended purpose. Theoretical knowledge may be too radical to be accepted by scholars, let alone practitioners (Kuhn, 1962). So quasi-theoretical knowledge provides an avenue for scholars to develop new ideas without meeting the threshold of theoretical knowledge. However, if quasi-theoretical knowledge impacts practice, then it has added value.

On the other hand, applied knowledge should be for the purpose of impacting practice. Unlike theoretical knowledge, applied knowledge should not be limited to a specified domain. If a scholar creates applied knowledge for the sole purpose of impacting management practitioners, it is applicable to medical practitioners as well and then it is a bonus. Ultimately, applied knowledge should be created to impact practice.

Banks et al. (2016) also suggest that scholars produce academic knowledge that is of "little use or interest to practitioners." The findings of this dissertation do not support their idea. In fact, this study suggests that some practitioners are actively reading academic knowledge and sharing the results they

find interesting. In fact, as discussed before, there is evidence that practitioners find unfiltered academic knowledge more interesting than academic knowledge translated by popular press authors.

Additionally, prior research suggested that the writing style of academics contributed to the science-practice gap (e.g., Leisenring & Johnson, 1994). Furthermore, researchers suggest "knowledge transfer," the inability to efficiently translate the academic language for practitioners (Van de Ven & Johnson, 2006) as a cause for lack of scientific knowledge impact on practice. Shapiro et al. (2007) propose that the meaning of scientific knowledge is lost in translation from science to practice. Others have suggested that both the scientist and practitioner are experts in their respective domains but laymen to each other. So, the science-practitioner gap arises from their difficulty in finding "common ground" in the layman-expert communication dyad (Kieser & Leiner, 2009). The findings of this study did provide support for their statements. Compatibility, measured by writing style, was not a significant factor in determining practitioner adoption. However, the most significant contribution is that this study is the first to view the topic through the lens of Diffusion of Innovations Theory.

Diffusion of Innovation Research

Despite Rogers (1962) defining innovation as an idea, practice, or object that is seen to be new by, there are other plausible bases of logic that could be used to study these relations, such as institutional theory. Institutional theory is robust in understanding how social norms develop (Scott, 1987), whereas Diffusion of Innovation places a greater emphasis on how innovations move from one group to another. Although this study uses Diffusion of Innovation Theory to find support for the idea that academic research is an innovation, there is an interesting tie to the social norms and traditions of academia.

For example, in academia, increased citation counts (relative advantage) have favorable impacts on authors and publication prestige (Stremersch et al., 2007). This study supports the idea that citation counts are not only favorable for impact for authors and publishers but is significant to practitioner

adoption as well. However, the level of impact is greater for articles with the highest number of citations.

Similarly, researchers who present complex ideas using complex writing styles (complexity) are perceived as more competent than others who present simpler ideas and use simpler writing styles (Armstrong, 1980). Although scholars may be found to be more competent when using a complex writing style, this study found that writing style had no significant impact on practitioner adoption. However, there was support for the notion that the type of article scholars choose to write do impact practitioner adoption. This study suggests that theoretical articles will be adopted to a lesser degree than meta-analysis, review, mixed methods, and qualitative articles. Similarly, the field of research will impact practitioner adoption. Based on this study, it is reasonable to expect that some fields of research have more potential to be adopted by practitioners than other fields of research. It is only by treating academic knowledge as an innovation and applying the tenets of Diffusion of Innovation Theory that is it possible to understand how the attributes of journal articles impact practitioner adoption.

Another significant impact on diffusion of innovation research is introducing altmetrics to the literature. In general, altmetrics is defined as a way of determining the societal impact of academic research (Piwowar, 2013). Diffusion of Innovation research looks at how "innovations" are diffused and adopted by practitioners (Rogers, 1962). Techniques using altmetrics emphasizes social media activity as a tool to measure societal impact (Shema et al., 2014). This study supports the notion that altmetric data is a good measure of practitioner adoption as well. More importantly, this study supports the idea that altmetrics techniques are useful in determining the impact of research beyond academia (Bornmann, 2014).

The most significant impact of this dissertation is expanding the boundaries of DOI. By marrying systems theory with spillover effect, this study examined how innovations diffuse from one system to another. In past DOI studies that compared the diffusion and adoption of innovations between different systems, those systems were homogenous, i.e., villagers (Rogers & Kincaid, 1981). This

study investigated the diffusion of innovation across heterogenous systems: science and practice. As such, DOI can predict the spillover effect of innovations across distinct systems. This opens the doors to evaluate the spillover effect across more than two systems.

Additionally, this study investigated classes of innovation rather than just a singular product. Future research is not limited to focusing on singular products. Also, time was not a significant result in practitioner adoption. If time does not have a significant impact, it suggests that the attributes of an innovation contribute more to the diffusion and adoption than time.

Limitations

Although a thorough attempt was made to minimize the impacts of limitations, all research has limitations that are difficult to overcome. For this study, secondary data was used. A concern with using secondary is that there no way to know whether the primary collection was done validly and reliably (Cowton, 1998). However, using archival data means that there is little threat to internal validity. The publication of the popular press book comes after the publication of the focal articles contained within. Likewise, the Tweets occurred after the publication of the article. In terms of statistical validity, there are limited threats to statistical validity. Additionally, as a result of the large sample size, there is a low likelihood that the outcomes of this study will be due to chance.

However, there are threats to external validity. This research selected management and entrepreneurship disciplines as the focus. The field of entrepreneurship is suggested to be the most applied field of management (Baker & Pollock, 2007). Therefore, the results may not be generalizable to other fields outside of management and entrepreneurship.

Additionally, introducing unknown bias is a concern for researchers using secondary data. There is a concern that bias was a factor when analyzing data from the Altmetric.com database. The Altmetric.com database only collects data on academic articles with a digital object identifier. This system was not implemented until October of 1987, and publisher's adoption occurred over time (Digital Object Identifies, 1998). Although articles that predate its implementation are being assigned by their publishers, the digital footprint of the article prior to system assignment is not recorded.

Therefore, articles that were originally published along with a digital object identifier are more likely to have a complete digital footprint when compared to articles that received a digital object identifier after their original publication date.

Directions for Future Research

By finding support for the idea that the attributes of academic knowledge both predict and quantify the level of practitioner adoptions opens numerous avenues for future research. This study focused solely on Rogers' (1962) original innovation characteristics. Tornatzky & Klein (1982) compiled a list of an additional 20 attributes that impact adoption. With more than 70% of variance left unexplained in this study, exploring additional innovation attributes is a natural next step for future research.

Additionally, this study looked at adoption. However, there are calls for more diffusion of innovation research to use implementation as the dependent variable. Implementation is the next step in the diffusion process and is defined as actually using the innovation (Rogers, 2010). A logical next step will be to determine whether the Altmetric.com database is a viable means to measure practitioner implementation.

This study provided a new way to study the science-practice gap. By viewing academic research as an innovation and applying the theoretical framework of Diffusion of Innovation Theory, scholars now have a better understanding of the attributes of academic knowledge that will be most impactful to practice. Also, this study opens a new stream of research and provides a method for scholars to investigate further additional attributes of academic knowledge that will assist in bridging the science-practice gap.

Furthermore, the results of this project suggest that the expected degree of practitioner adoption should vary based on the field of research and type of academic discovery created. This should be a little unsettling for academics as it put us on notice. Ultimately, this project suggests that a willingness to impact practice is a choice. However, there is a solution. In the same way that academics split the profession into tenure-track and clinical professors, perhaps it is time to

dichotomize the tenure-track professors: one group of tenure-track professors who develop foundational research and an equally important group that looks to impact practice. Regardless, my findings open the doors for a measure of scholarly impact on practice, and it should be on an equal footing with measures of scholarly impact on academia.

REFERENCES

Aal, L.B., Parmar, J.N., Patel, V.R., & Sen, D.J. (2014). WhatsApp, Skype, Wickr, Viber, Twitter and Blog are ready to asymptote globally from all corners during communications in latest fast life. *Research Journal of Science and Technology*, 6(2), 101.

Aiken, M., & Hage, J. (1971). The organic organization and innovation. *Sociology*, 5(1), 63-82.

AlBar, A.M., & Hoque, M.R. (2017). Factors affecting cloud ERP adoption in Saudi Arabia: An empirical study. *Information Development*, 35(1), 150-164.

Amoruso, S. (2015). # Girlboss. Portfolio.

Arlettaz, R., Schaub, M., Fournier, J., Reichlin, T.S., Sierro, A., Watson, J.E., & Braunisch, V. (2010). From publications to public actions: when conservation biologists bridge the gap between research and implementation. *BioScience*, 60(10), 835-842.

Armstrong, J.S. (1980). Unintelligible management research and academic prestige. *Interfaces*, 10(2), 80-86.

Armstrong, W.W. (1994). The boss has read another new book! *Management Review*, 83(6), 61.

Arnold, G.C., & Hatzopoulos, P.D. (2000). The theory□practice gap in capital budgeting: evidence from the United Kingdom. *Journal of Business Finance & Accounting*, 27(5□6), 603-626.

Audi, R. (2010). Epistemology: A contemporary introduction to the theory of knowledge. New York: Routledge.

Audretsch, D.B., & Keilbach, M. (2007). The theory of knowledge spillover entrepreneurship. *Journal of Management Studies*, 44(7), 1242-1254.

Bach, G.L. (1966). Lessons from business education. Memo to Marshall Robinson. Ford Foundation Archives, New York.

Baker, T., & Pollock, T.G. (2007). Making the marriage work: The benefits of strategy's takeover of entrepreneurship for strategic organization. *Strategic Organization*, 5(3), 297-312.

Banks, G C., Pollack, J.M., Bochantin, J.E., Kirkman, B.L., Whelpley, C.E., & O'Boyle, E.H. (2016). Management's science–practice gap: A grand challenge for all stakeholders. *Academy of Management Journal*, 59(6), 2205-2231.

Bartunek, J.M., & Rynes, S.L. (2014). Academics and practitioners are alike and unlike: The paradoxes of academic–practitioner relationships. *Journal of Management*, 40(5), 1181-1201.

Bass, F.M. (2004). A new product growth for model consumer Durables/Comments on "A new product growth for model consumer durables." *Management Science*, 50(12), 1825-1840.

Becker, B., & Gerhart, B. (1996). The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal*, 39(4), 779-801.

Berger, J., Draganska, M., & Simonson, I. (2007). The influence of product variety on brand perception and choice. *Marketing Science*, 26(4), 460-472.

Berger, J., & Schwartz, E.M. (2011). What drives immediate and ongoing word of mouth? *Journal of Marketing Research*, 48(5), 869-880.

Bero, L.A., Grilli, R., Grimshaw, J.M., Harvey, E., Oxman, A.D., & Thomson, M.A. (1998). Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. BMJ (Clinical research ed.), 317(7156), 465-468.

Blackburn, S. (1996). The Oxford Dictionary of Philosophy. Oxford: Oxford University Press.

Blattberg, R.C., & Deighton, J. (1996). Manage marketing by the customer equity test. *Harvard Business Review*, 74(4), 136.

Bonin, J.P., Jones, D.C., & Putterman, L. (1993). Theoretical and empirical studies of producer cooperatives: will ever the twain meet? *Journal of Economic Literature*, 31(3), 1290-1320.

Bornmann, L. (2014). Do altmetrics point to the broader impact of research? An overview of benefits and disadvantages of altmetrics. *Journal of Informetrics*, 8(4), 895-903.

Box, G.E., & Tidwell, P.W. (1962). Transformation of the independent variables. *Technometrics*, 4(4), 531-550.

Bud, R. (2012). "Applied science": a phrase in search of a meaning. *Isis*, 103(3), 537-545.

Burnyeat, M.F. (1996). Enthymeme: Aristotle on the rationality of "rhetoric." In *Essays on Aristotle's Rhetoric*, 88-115.

Campbell, D.T., & Fiske, D.W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, 56(2), 81.

Campbell, D.T., & Stanley, J.C. (1963). Experimental and Quasi-experimental Designs for Research. Titusville NJ: Hopewell.

Campbell, N. (1952). What is Science? London: Cambridge University Press.

Carnap, R., & Jeffrey, R. (1971). Studies in inductive logic and probability. Berkeley: University of California Press.

Choi, S. (2015). The two-step flow of communication in Twitter-based public forums. Social *Science Computer Review*, 33(6), 696-711.

Clark, T., & Greatbatch, D. (2004). Management fashion as image-spectacle:Tthe production of best-selling management books. *Management Communication Quarterly*, 17(3), 396-424.

Cornelissen, J.P., & Durand, R. (2014). Moving forward: Developing theoretical contributions in management studies. *Journal of Management Studies*, 51(6), 995-1022.

Cowton, C.J. (1998). The use of secondary data in business ethics research. *Journal of Business Ethics*, 17(4), 423-434.

Damanpour, F. (1988). Innovation type, radicalness, and the adoption process. *Communication Research*, 15(5), 545-567.

Damanpour, F., & Evan, W. (1984). Organizational Innovation and Performance; The Problem of ''Organizational Lag.'' *Administrative Science Quarterly*, 29(3), 392.

d'Aspremont, C., & Jacquemin, A. (1988). Cooperative and noncooperative R&D in duopoly with spillovers. *The American Economic Review*, 78(5), 1133-1137.

Dear, P. (1985). Totius in verba: Rhetoric and authority in the early Royal Society. *Isis*, 76(2), 145-161.

Devisch, R., & Nyamnjoh, F.B. (Eds.). (2011). The postcolonial turn. Oxford UK: African Books Collective.

Digital Object Identifiers. (1998). Online and CD-Rom Review, 22(2), 115-118.

Driver, R., Asoko, H., Leach, J., Scott, P., & Mortimer, E. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher*, 23(7), 5-12.

Duhigg, C. (2012). The power of habit: Why we do what we do in life and business. Clarence NY: Random House.

Eisenhardt, K.M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57-74.

Engwall, L., & Zamagni, V. (Eds.). (1998). Management education in historical perspective. Manchester UK: Manchester University Press.

Evan, W.M. (1966). Organizational lag. *Human Organization*, 25(1), 51-53.

Evans, J. (1998). The history and practice of ancient astronomy. New York: Oxford University Press.

Fine, A. (1984). The natural ontological attitude. In The philosophy of science (p. 261-277). Cambridge MA: MIT Press.

Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology*, 32(3), 221.

Flexner, A. (1930). Universities, American, English, German. New York. Oxford University Press.

Fuller, S. (2003). Kuhn vs. Popper: The struggle for the soul of science. Cambridge UK: Icon Books.

Fry, M.J., & Ohlmann, J.W. (2012). Introduction to the special issue on analytics in sports, Part I: General sports applications. *Informs Journal on Applied Analytics*

Gad, T., & Nicholas, I. (2003). Leadership branding. In *Beyond branding: how the new values of transparency and integrity are changing the world of brands*, 183-198. London UK: Kogan Page Publishing.

Galilei, G. (2016). Sidereus Nuncius, or The Sidereal Messenger. Chicago: University of Chicago Press.

Gatignon, H., & Robertson, T.S. (1985). A propositional inventory for new diffusion research. *Journal of Consumer Research*, 11(4), 849-867.

Geuens, M. (2011). Where does business research go from here? Food-for-thought on academic papers in business research. *Journal of Business Research*, 64(10), 1104-1107.

Gladwell, M. (2008). Outliers: The story of success. Hachette UK.

Goldman, A., & Blanchard, T. (2018). Social Epistemology, in The Stanford Encyclopedia of Philosophy (Summer 2018 Edition), Edward N. Zalta (ed.), URL = https://plato.stanford.edu/archives/sum2018/entries/epistemology-social/

Gordon, R.A., & Howell, J.E. (1959). Higher education for business. *The Journal of Business Education*, 35(3), 115-117.

Graham, D. W. (2007). Heraclitus. In The Stanford Encyclopedia of Philosophy. Stanford CA: Stanford University.

Griliches, Z. (1979). Issues in assessing the contribution of research and development to productivity growth. *Bell Journal of Economics*, 10(1), 92-116.

Hambrick, D.C. (1994). What if the academy actually mattered? *Academy of Management Review*, 19(1), 11-16.

Hammarfelt, B. (2014). Using altmetrics for assessing research impact in the humanities. *Scientometrics*, 101(2), 1419-1430.

Hardwig, J. (1985). Epistemic dependence. *The Journal of Philosophy*, 82(7), 335-349.

Harvey, L.J., & Myers, M.D. (1995). Scholarship and practice: The contribution of ethnographic research methods to bridging the gap. *Information Technology & People*, 8(3), 13-27.

Harzing, A.W., & Van Der Wal, R. (2009). A Google Scholar h□index for journals: An alternative metric to measure journal impact in economics and business. *Journal of the American Society for Information Science and Technology*, 60(1), 41-46.

Hirsch, J.E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences*, 102(46), 16569-16572.

Hoffmann, V., Probst, K., & Christinck, A. (2007). Farmers and researchers: How can collaborative advantages be created in participatory research and technology development? *Agriculture and Human Values*, 24(3), 355-368.

Huxley, T.H. (1881). Science and culture, and other essays (Vol. 32). New York: Macmillan.

Introna, L., & Nissenbaum, H. (2000). Defining the web: The politics of search engines. *Computer*, 33(1), 54-62.

Issitt, J. (2004). Reflections on the study of textbooks. *History of Education*, 33(6), 683-696.

Ivory, C., Miskell, P., Shipton, H., & White, A. (2006). UK business schools: Historical contexts and future scenarios. AIM advisory report.

Kahneman, D. (2011). Thinking, fast and slow. New York: Macmillan.

Kaplan, A. (2014). European management and European business schools: Insights from the history of business schools. *European Management Journal*, 32(4), 529-534.

Karahanna, E., Agarwal, R., & Angst, C.M. (2006). Reconceptualizing compatibility beliefs in technology acceptance research. *MIS Quarterly*, 781-804.

Kast, F.E., & Rosenzweig, J.E. (1972). General systems theory: Applications for organization and management. *Academy of Management Journal*, 15(4), 447-465.

Kieser, A. (2004). The Americanization of academic management education in Germany. *Journal of Management Inquiry*, 13(2), 90-97.

Kelly, J.A., Somlai, A.M., DiFranceisco, W.J., Otto-Salaj, L.L., McAuliffe, T.L., Hackl, K.L., Heckman, T.G., Holtgrave, D.R., & Rompa, D. (2000). Bridging the gap between the science and service of HIV prevention: transferring effective research-based HIV prevention interventions to community AIDS service providers. *American Journal of Public Health*, 90(7), 1082.

Ketchen Jr, D.J., Ireland, R.D., & Baker, L.T. (2013). The use of archival proxies in strategic management studies: castles made of sand? *Organizational Research Methods*, 16(1), 32-42.

Kieser, A., & Leiner, L. (2009). Why the rigour–relevance gap in management research is unbridgeable. *Journal of Management Studies*, 46(3), 516-533.

Kitcher, P. (2004). On the autonomy of the sciences. *Philosophy Today*, 48 (Supplement), 51-57.

Klein, J. (1989). A commentary on Plato's Meno. Chicago: University of Chicago Press.

Knights, D., & Scarbrough, H. (2010). In search of relevance: perspectives on the contribution of academic—practitioner networks. *Organization Studies*, 31(9-10), 1287-1309.

Kratzer, J., & Lettl, C. (2009). Distinctive roles of lead users and opinion leaders in the social networks of schoolchildren. *Journal of Consumer Research*, 36(4), 646-659.

Kuhn, T. (1962). The structure of scientific revolutions. Chicago: University of Press.

Landers, M.G. (2000). The theory-practice gap in nursing: The role of the nurse teacher. *Journal of Advanced Nursing*, 32(6), 1550-1556.

Langford, J.J. (1992). Galileo, science, and the church. Ann Arbor: University of Michigan Press.

Lazarsfeld, P.F., & Merton, R.K. (1964). Friendship as a social process: A substantive and methodological analysis. *Freedom and Control in Modern Society*, 18(1), 18-66.

Lehrer, K. (1987). Personal and social knowledge. *Synthese*, 73(1), 87-107.

Leigh Star, S. (2010). This is not a boundary object: Reflections on the origin of a concept. *Science, Technology, & Human Values*, 35(5), 601-617.

Leisenring, J.J., & Johnson, L.T. (1994). Accounting research: On the relevance of research to practice. *Accounting Horizons*, 8(4), 74.

Lemercier, C. (2003). La chambre de commerce de Paris, acteur indispensable de la construction des normes economiques (premiere moitie du XIXE siècle). *Genèses*, (1), 50-70.

Lewis, L. (2006). Advice on communicating during organizational change: The content of popular press books. *The Journal of Business Communication*, 43(2), 113-137.

Li, X. (2010). The management academia: A naked carnival. In Proceedings of the Academy of Management Annual Meeting 2010.

Luhmann, N. (1982). The differentiation of society. New York: Columbia Press.

Luhmann, N. (1995). Social systems. Stanford, CA: Stanford University Press.

Luhmann, N. (2006). System as difference. *Organization*, 13(1), 37-57.

Lyytinen, K., & Damsgaard, J. (2001, April). What's wrong with the diffusion of innovation theory?. In Working Conference on Diffusing Software Product and Process Innovations (pp. 173-190). Boston: Springer.

Mazza, C., & Alvarez, J.L. (2000). Haute couture and pret-a-porter: The popular press and the diffusion of management practices. *Organization Studies*, 21(3), 567-588.

McGrail, M.R., Rickard, C.M., & Jones, R. (2006). Publish or perish: A systematic review of interventions to increase academic publication rates. *Higher Education Research & Development*, 25(1), 19-35.

McMahon, S.R., & Orr, L.A. (2017). Pop psychology? Searching for evidence, real or perceived, in bestselling business books. *Organizational Dynamics*, 46(4), 195-201.

Meinel, C. (1985). Reine und angewandte Chemie Die Entstehung einer neuen Wissenschaftskonzeption in der Chemie der Aufklärung. *Berichte zur Wissenschaftsgeschichte*, 8(1), 25-45.

Merton, R.K. (1973). The sociology of science: theoretical and empirical investigations (No. 500 M4). Chicago: University of Chicago Press.

Miller, G. (1957). The adoption of inoculation for smallpox in France and England in the 18th century (p. 146). Philadelphia: University of Pennsylvania Press.

Morse, J.M. (2003). Principles of mixed methods and multimethod research design. *Handbook of mixed methods in social and behavioral research*, 1, 189-208.

Mort, P.R. (1953). Educational adaptability. Metropolitan School Study Council.

Murray, C.E. (2009). Diffusion of innovation theory: A bridge for the research□practice gap in counseling. *Journal of Counseling & Development*, 87(1), 108-116.

Niiniluoto, I. (1984). Is science progressive? (Vol. 177). New York: Springer Science & Business Media.

Niiniluoto, I. (2018). Social aspects of scientific knowledge. *Synthese*, 1-22.

Niiniluoto, I., Sintonen, M., & Wolenski, J. (Eds.). (2004). Handbook of epistemology. New York: Springer Science & Business Media.

Ortmann, G.F., & King, R.P. (2007). Agricultural cooperatives I: History, theory and problems. *Agrekon*, 46(1), 18-46.

Ottaway, R.N. (1983). The change agent: A taxonomy in relation to the change process. *Human Relations*, 36(4), 361-392.

Paasche-Orlow, M.K., Taylor, H.A., & Brancati, F.L. (2003). Readability standards for informed-consent forms as compared with actual readability. *New England Journal of Medicine*, 348(8), 721-726.

Papoulis, A. (1984), Probability, random variables, and stochastic processes. New York: McGraw-Hill.

Pasteur, L., Joubert, J., & Chamberland, C. (1878). The germ theory of disease. CR Hebd Seances *Academy of Science*, 86, 1037-52.

Pfeffer, J., & Fong, C.T. (2002). The end of business schools? Less success than meets the eye. *Academy of Management Learning & Education*, 1(1), 78-95.

Pink, D.H. (2019). When: The scientific secrets of perfect timing. Westminster UK: Penguin Press.

Piwowar, H. (2013). Altmetrics: Value all research products. *Nature*, 493(7431), 159.

Popper, K. (2014). Conjectures and refutations: The growth of scientific knowledge. New York: Routledge.

Rasche, A., & Behnam, M. (2009). As if it were relevant: A systems theoretical perspective on the relation between science and practice. *Journal of Management Inquiry*, 18(3), 243-255.

Rogers, E. M. (1962) The diffusion of innovations. New York: Free Press.

Rogers, E.M. (2003). The diffusion of innovation 5th edition. New York: Simon and Schuster.

Rogers, E.M. (2010). Diffusion of innovations. New York: Simon and Schuster.

Rogers, E.M., & Cartano, D.G. (1962). Methods of measuring opinion leadership. *Public Opinion Quarterly*, 435-441.

Rogers, E.M., & Kincaid, D.L. (1981). Communication networks: Toward a new paradigm for research. New York: Free Press.

Rogers, E.M., & Shoemaker, F.F., & Floyd, F. (1971). Communication of innovations; A cross-cultural approach. New York: Free Press.

Rogers, E.M., & Van Es, J.C. (1964). Opinion leadership in traditional and modern Colombian peasant communities (No. 2). Department of Communication, Michigan State University.

Roll-Hansen, N. (2017). A historical perspective on the distinction between basic and applied science. *Journal for General Philosophy of Science*, 48(4), 535-551.

Rothman, J. (1974). Planning and organizing for social change: Action principles from social science research (p. 226). New York: Columbia University Press.

Ryan, B., & Gross, N.C. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology*, 8(1), 15.

Ryan, B., & Gross, N. (1950). Acceptance and diffusion of hybrid corn seed in two Iowa communities. *Research Bulletin* (Iowa Agriculture and Home Economics Experiment Station), 29(372), 1.

Rynes, S.L., Bartunek, J.M. & Daft, R.L. 2001. Across the great divide: Knowledge creation and transfer between practitioners and academics. *Academy of Management Journal*, 44(2): 340-355.

Rynes, S.L., Colbert, A.E., & Brown, K.G. (2002). HR professionals' beliefs about effective human resource practices: Correspondence between research and practice. Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management, 41(2), 149-174.

Sam, C., & Van Der Sijde, P. (2014). Understanding the concept of the entrepreneurial university from the perspective of higher education models. *Higher Education*, 68(6), 891-908.

Sandberg, S. (2013). Lean in: Women. work and the will to lead. London: WH Allen.

Saxe, L., Cross, T., & Silverman, N. (1988). Children's mental health: The gap between what we know and what we do. *American Psychologist*, 43(10), 800.

Schlossman, S., Sedlak, M., & Wechsler, H. (1998). The 'New Look': The Ford Foundation and the Revolution in Business Education. *Selections*, 14(3), 8-28.

Scott, W.R. (1987). The adolescence of institutional theory. *Administrative Science Quarterly*, 493-511.

Seidl, D. (2005). The basic concepts of Luhmann's theory of social systems. *Advances in Organization Studies*, 14, 21.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. Academy of management review, 25(1), 217-226.

Shapiro, D.L., Kirkman, B.L., & Courtney, H.G. (2007). Perceived causes and solutions of the translation problem in management research. *Academy of Management Journal*, 50(2), 249-266.

Sharp, L. (1952). Steel axes for stone-age Australians. *Human Organization*, 11(2), 17-22.

Shema, H., Bar□Ilan, J., & Thelwall, M. (2014). Do blog citations correlate with a higher number of future citations? Research blogs as a potential source for alternative metrics. *Journal of the Association for Information Science and Technology*, 65(5), 1018-1027.

Smith, T.J., & McKenna, C.M. (2013). A comparison of logistic regression pseudo R2 indices. *Multiple Linear Regression Viewpoints*, 39(2), 17-26.

Spier, R. (2002). The history of the peer-review process. *Trends in Biotechnology*, 20(8), 357-358.

Star, S.L., & Griesemer, J.R. (1989). Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19(3), 387-420.

Starkey, K., & Madan, P. (2001). Bridging the relevance gap: Aligning stakeholders in the future of management research. *British Journal of Management*, 12, S3-S26.

Stremersch, S., Verniers, I., & Verhoef, P.C. (2007). The quest for citations: Drivers of article impact. *Journal of Marketing*, 71(3), 171-193.

Sulpizi, M., & Sprik, M. (2008). Acidity constants from vertical energy gaps: density functional theory based molecular dynamics implementation. *Physical Chemistry Chemical Physics*, 10(34), 5238-5249.

Susman, G.I., & Evered, R.D. (1978). An assessment of the scientific merits of action research. *Administrative Science Quarterly*, 582-603.

Tabachnick, B.G., & Fidell, L.S. (2014). Using multivariate statistics. London: Harlow.

Taylor, M. (2013), Towards a common model of citation: some thoughts on merging altmetrics and bibliometrics. *Research Trends*, 35, 19-22.

Tornatzky, L., & Klein, K. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *Engineering Management, IEEE Transactions*, EM-29(1), 28-45.

Trahan, E.A., & Gitman, L.J. (1995). Bridging the theory-practice gap in corporate finance: A survey of chief financial officers. *The Quarterly Review of Economics and Finance*, 35(1), 73-87.

Tucker, B.P., & Schaltegger, S. (2016). Comparing the research-practice gap in management accounting: A view from professional accounting bodies in Australia and Germany. *Accounting, Auditing & Accountability Journal*, 29(3), 362-400.

Turnbull, P.W., & Meenaghan, A. (1980). Diffusion of innovation and opinion leadership. *European Journal of Marketing*, 14(1), 3-33.

Üsdiken, B. (2004). Americanization of European management education in historical and comparative perspective: A symposium. *Journal of Management Inquiry*, 13(2), 87-89.

Van De Ven, A.H. (2002). 2001 Presidential address - Strategic directions for the Academy of management: This academy is for you! *Academy of Management Review*, 27(2), 171-184.

Van de Ven, A.H. (2007). Engaged scholarship: A guide for organizational and social research. Oxford UK: Oxford University Press on Demand.

Van de Ven, A.H., & Johnson, P.E. (2006). Knowledge for theory and practice. *Academy of Management Review*, 31(4), 802-821.

Van Orman Quine, W. (1976). Two dogmas of empiricism. In Can Theories be Refuted? (pp. 41-64). Heidelberg Germany: Springer Dordrecht.

Venkatraman, M.P. (1989). Opinion leaders, adopters, and communicative adopters: A role analysis. *Psychology & Marketing*, 6(1), 51-68.

Vermeulen, F. (2005). On rigor and relevance: Fostering dialectic progress in management research. *Academy of Management Journal*, 48(6), 978-982.

Vernon, R. (1979). The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics*, 41(4), 255-267.

Weenig, M.W., & Midden, C.J. (1991). Communication network influences on information diffusion and persuasion. *Journal of Personality and Social Psychology*, 61(5), 734.

Weller, J.M. (2004). Simulation in undergraduate medical education: bridging the gap between theory and practice. *Medical Education*, 38(1), 32-38.

Wellin, E. (1955). Water boiling in a Peruvian town. *Health, Culture and Community*, 71-103.

Wernerfelt, B. (1984). A resource□based view of the firm. *Strategic Management Journal*, 5(2), 171-180.

Wheelen, T.L., & Hunger, J.D. (1975). Graduate business education-75th anniversary (1900-1975). *Journal of Management*, 1(1), 51-53.

Whitley, R. (1984). The scientific status of management research as a practically□oriented social science. *Journal of Management Studies*, 21(4), 369-390.

Wren, D.A., & Van Fleet, D.D. (1983). History in schools of business. *Business and Economic History*, 12, 29-35.

Yan, E. (2014). Research dynamics: Measuring the continuity and popularity of research topics. *Journal of Informetrics*, 8(1), 98-110.

APPENDICES

APPENDIX A: CRITICAL INCIDENT SURVEY AND ANSWERS

Question 1 - Take a moment to identify your last significant work-related problem in which you did not have an immediate solution. For the remainder of the survey, use the work-related problem that you have identified to guide your responses. Now, detail the specifics related to this novel work-related problem.
I sell chemical catalysts type products, a customer had a feed stream change and we did not have a product to directly replace the current one, as we have been selling this version for 30 years. We needed a new product, and we did not have one. Blindsided
Development of analytical tools for the upsell services business
Food and Drug Administration (FDA) put a hold and recalled one of the components used in the preparation of kits the company sell to hospitals. As an advisor and strategic accounting and finance partner of the company I was charged to come out with the financial implication of the FDA recall.
How to engage students in a large 200+ person sections of an introductory business course. In large classes, students tend to not be attentive and not actively engaged.
Which new program to highlight for a crowdfunding campaign
High turnover in nursing units with a very low level of readily available talent pool resulting in entire shifts not being covered by the needed level of clinical care professionals.
I write executive summaries of academic articles and turn them into actionable, digestible one pagers for practitioners.
A significant work-related problem for my company is regarding our transportation challenge. We are a ~$100M CPG company that produced frozen product. We outsource all transportation, using a 3rd party warehouse and 3rd party trucking companies. With rising costs in transportation and limited availability of freezer warehouses it is very easy to get locked into a contact with a transportation vendor due to the fact that switching is not simple. In our industry there are limited warehousing companies that have freezer storage. Outside of ingredients & packaging, transportation is our largest P&L item. At this time we are in the process of trying to determine if we stay with our current vendor, switch transportation vendors or bring it all in house. There is multiple variables in the analysis: volume, freight lanes, fuel costs, warehouse costs, impact on customers, etc. that has to be taken into consideration before a change can happen.
I had a student in the military report me to veteran's affairs, on campus, as not being accommodating to his current service requirements.
Female employee brought her new born baby to work, previously allowed by supervisor. However, her co-worker did not agree or care for the baby to be allowed in an office work environment. Ask my office (HR) if she was breaking policy and wanted to know what they could do about it IF she was.
Loss of physical inventory with overstated inventory counts in the ERP system
I had to decide how to interpret a recently enacted statute with inconsistent language

I am an independent oil and gas producer. I identify oil and gas drilling prospects with the help of a geologist and/or engineer. After I have identified a prospect I work with a landman to determine how best to acquire leasing rights to the acreage, usually an oil and gas lease or a farmout. I identified and acquired acreage in an oil and gas prospect approximately four years ago. I raised drilling funds and tested the first idea. It was unsuccessful. The geologist identified a second prospect on the acreage. I thought the idea had merit and decided to raise funds to test the concept. My problem was the difficulty in convincing potential investors to participate in the prospect.
The Main problem I have is the blend between accountability and recognition. Most people only work hard when there is pressure out on them or fear based expectations. It is my preferable method to use recognition to motivate the team of independent agents but it doesn't work as well as pressure, getting upset, and methods of exclusion and accountability. I always struggle with how much positive motivation and how much fear based accountability measures I use to drive success.
We had to let go of two key members of our management team, the following day a key member of our manager went out with a critical condition and will likely be out for at least a year.
We had an opportunity to bid on a project in an industry that we were trying to crack for several years. All the previous potential clients were insisting that we had valued their type of business before making it difficult to get an opportunity.
I have units that have varying tax rates depending on the nature of the food service we provide for that location. One organization can have 3 buildings with onsite food service, kiosks, and vending machines. I have run into an issue where the onsites and the kiosks are linked and are charging the wrong tax rates. The onsites have a higher rate than the kiosks which will be an issue when I file the tax return if I don't get it resolved.
I recently had an issue creating a dashboard that captured various criteria scores for several metrics being captured across multiple technical services.
Question 2 - Where did you turn or what avenues did you take to find solutions for this particular work-related problem?
Well first we had to get a sample of their feed and send to our R&D center, and gain an understanding of what feed stream changes existed.
Explored creating a tool internally as well as seeking a consulting firm to assist in the development of the solution
I have to read a lot about literature about FDA recall, worked with people at the plant level to understand the flow of the manufacturing process, I put a team together from several functional department to brainstorm about the event.
I started with two things: (1) google search for solution and (2) company IT department resources.
I turned to my employees and also to those running the crowdfunding campaign
Design thinking methods
I had to test how to best remove academia from research articles, without losing the point of the research, and this has to be done in less than 200 words. I had to unscientifically get friends to read the summaries, and let me know if they still made sense and were appealing enough to want to read the academic paper. I had to find the tone to get someone in practice to want to pick up a journal article to learn more.
We engaged with the two main warehousing companies that support our industry, currently one of them is our vendor. Additionally, we engaged an independent transportation consulting group that analyzed our freight lanes, storage requirements and adherence to our customers 'on time in full' (OTIF) requirement in order to prevent fines for us. These OTIF fines can be quite expensive.
I turned to my director, explained the situation as I saw it, and asked what else he thought I should do.
I talked with my in-house attorney. because there was no organizational policy that she was breaking other then annoying co-workers. He asked me what I did/say and I stated, " I said it was okay if she was allowed by her supervisor, no rules where broken."
Brainstormed with colleagues on root cause analysis
I conducted research on interpreting legislative intent, looked at disctionary meanings of certin words in the statue, reahed out to other individuals for advice
I used my business contacts to identify additional potential investors.
Usually mentor ship is a key resource. Consulting with those who have been in business longer than me who have experienced similar experiences.
Looked to our bench to replace one of the restaurant GM terminated by elevating two staff members to cover one terminated employee. Second terminated employee is still not replaced.

Our key management member: we divided up the responsibilities until we have a his long term prognosis. We will not back fill his position until we have clarity on his capabilities once he returns. This is not a decision based on indispensability, it's based on his contribution he has made to our company, we will work with him.
We had to first sell the client on why we could do the job. We knew we would have to do more research on this industry than what we typically do. So we let the client know that we subscribe to services that give us the latest industry reports (which we do). However, we also knew that we were also going to have to purchase specific books on this industry to not only learn some things but also to document in our report. So we turned to the internet to order the book that we thought would be useful for this assignment.
I have contacted our technical support team to find out how to separate the onsites from the kiosks.
I used the customer's back end collaborative environment to develop input tables, dynamic pivot charts with simple sorting and filtering capabilities. I used google to capture code and better understand how the database app would integrate with the back end online collaborative environment. I "borrowed" code from sites such as W3c Schools and several blog sites. I also asked some technical subject matter experts that used the applications and / or environment to do similar things to see if I could borrow some of their knowledge.
Question 3 - Now take a moment to think of the solution(s) you compiled to solve this work-related problem. Please detail the initial solution that you implemented to solve the problem.
We had to develop a quick solution, we first adjusted the operating parameters for a temporary fix, then to fix the bigger problem we needed a new more robust catalyst. So R&D, Develop a product, produce the product (lab scale), then with plant capital, had to have changes, improvements to the process to make the new product, 6 months, later a new product was produced to handle the new feed stream.
After conducing a cost-benefit assessment, we decided to pursue an internal solution. The solution consisted of a multi-dimensional tool supported by existing applications, such as HFM and Oracle GL
I brainstorm with the manufacturing team, I mapped out the flow of manufacturing to capture various stages in the process where cost is impacted.
The initial solution was a pre-approved university-wide solution. The solution did not allow for the full functionality desired, but was an adequate immediate solution.
I have not finalized a solution, but the solution that I am leaning towards is to highlight each of the programs in the campaign.
We prototyped a few solutions and piloted them in different units to see what worked and didnâ€™t work. We piloted alternative work mix (more nursing support than nurses) in one unit. In another, we piloted alternate e scheduling.
Initially, I went with 3 bullet points. I answered the following questions: what, so what, now what. Each bullet got 2 sentences maximum. Boiling down 15-40 pages into 6 sentences max. (This proved to be too little). I ended up with 4 sentences (max) per bullet, so the article is distilled into 3 short paragraphs.
While we have not come to a complete resolution we are in the final stages. Given the concentration and reliance that we have with one vendor we are at the mercy of their increases in pricing. For a company to switch transportation / warehouse vendors is not a simple task. After analysis of our expected volume by customer, the expected freight lane requirements, and the risk of reliance on one vendor we have decided to move our main customer to a new vendor. This vendor has an existing relationship with our main customer so we will see some good economies of scale with our freight cost that the analysis has proven out. By having multiple sources if one vendor has any issues we will be able to leverage the other vendor. Our current concentration with one transportation vendor is not sustainable and puts us as risk. In our analytics we used the review of our historical freight lane cost with the associated volume, our 2-3 year outlook on volume and what part of the country we would expect to ship to, the expected rising costs of fuel and labor, the transportation companies historical on time records and the risk of conversion with our customers. After review of all these variable we decided to split the business. This also allowed us to get more competitive pricing with our current vendor. Emailed the student and asked if he understood the accommodations already offered - then asked if he would like to come in and talk in person.
I referred her back to her supervisor to state her grievance and informed her that the organization had not official stance on it therefore it falls in the program directors hands.

Identified two possible scenarios that may contribute to the problem. We were able to eliminate one of the solutions with further analysis, leaving one scenario. We implemented four process changes to prevent future problems.
I chose the solution that had the safest results if challenged. It required more work on our end, and that of individuals in the legislature, but to go with an alternative interpretation could subject my agency to messy litigation
I was partially successful in identifying new investors. However, in order to get the well drilled and the geologic concept tested, I ended participating in the prospect for a larger amount that I had planned.
My initial solution was trial and error. See what works, and doesnâ€™t. Document how situations were handled in both occasions to see what lead to better results. Since then, I have taken extensive research on personality traits to understand what personality is driven to results by fear, accountability and those personalities which are better focused when awards, recognitions and bonuses are given out.
There was not an initial solution, we solved to cover near term (six months). The coverage of our management member is a result of his contribution to our executive team.
The main problem was that we weren't given a chance by the past potential clients. This time around we did a better chance of selling ourselves and the data/research that we do. Possibly dumb luck, but the client seemed to get really anxious to get things going and from my perspective it seemed like at that point of time, he liked what he heard from us more than the others that he had been talking to thus all of a sudden, we were moving forward. Now it was time to actually perform.
I initially thought I could manually separate them each month by running a report that split the items sold by the tax rate.
I ended up using ms access for the database and then displaying the charts in excel. Then I had to seamlessly connect them using javascript and CSS to allow the user to have an interactive experience w/ out knowing they were using MS products.
Question 4 - What were your reasons for selecting this solution to implement over the alternatives?
We did not have many alternatives.
Cost-benefit primarily. We also discussed that bringing an external vendor (e.g. consultant) would require additional time to get this person up to speed with our issues, processes and systems
The manufacturing team are close to the process and have better understanding about the flow of the manufacturing than me.
It met basic needs and was endorsed by Univerisity / company I worked for
various donors will be attracted to one program or another. This way, we might be able to capture them all.
Ease of implementation and readily available feedback.
I went with the final solution because it made a little narrative with a hook sentence at the end of bullet one.I ended up with that instead of the shorter version because I discovered that when the bullet responses were too short, the tone read like a teaser headline. My energy was spent in grabbing a reader's attention over conveying any information.
We are at a significant disadvantage having only one vendor for our transportation. While this vendor has been a good partner, as a business we must have multiple sources. Changing a transportation vendor is not as simple as changing most vendors. In our type of business, a company's transportation strategy is a key component to their stability and profitability. By diversifying our vendors this will allow us to hedge against any major disruption. The current transportation industry constraints is a significant challenge for all companies. Particularly ones like ours that have all transportation outsourced. We are at the mercy of the vendor which can and does translate into financial implications.
Wanted to attempt reconciliation, because he never made me aware of his feelings about my previous response to his quarry. He bypassed the chain of command rather than talking to me in person about his issues, and I wanted to know where he was coming from with his complaint.
There really wasn't anything else I could do
They seemed most immediate and effective
It was safest
The lease term was expiring and I needed to move ahead with drilling the well.
Iâ€™ve always learned that if I better myself, I will find better answers to grow our business and results. If my agents/employees need to change, I am left dependent on their ability to change. But if I change myself, I can drive better results.

How to cover the immediate problem with a solution that would add to the overall growth of our company.
An alternative could have been to seek out a partner that we could find that had prior experience in valuing this type of business. That being said, that is much harder than it sounds as you don't necessarily know how their processes line up with your processes of doing things. Thus, we have always found it better to do ourselves internally to maintain the quality control. Though there may be some things that are unique in valuing a new industry, many of the components in the process are the same across industries and it is just learning some specifics related to the new industry to pull it together.
I did not have to wait on support to get to my issues.
Using commercial off the shelf products meant that I would not need a programmer to modify a lot of code (just some simple javascript/CSS). It also meant that I could go to production quickly. I do not have much time in my work place as I am involved with troubleshooting operational issues as well as developing technical management tools. I have also become less technical as my career progress and more of a high level systems engineer.
Question 5 - Did the initial solution solve the work-related issue? If not, where did you turn to next? Did the next solution resolve the problem?
the initial did not solve - it temporarily masked the problem.
It did. The solution met the requirements from all stakeholders, including operations, sales, accounting and finance
several improvements were made as we brainstorm, before we arrived at the final template which captures various points in manufacturing where the costs have been impacted
It did, but not in a satisfactory manner. Then I found a solution via an internet search and speaking with colleagues.
The problem has not been resolved yet. We are still debating strategy.
The workforce mix solution yielded better results than the alternative scheduling. We installed the workforce mix solution in one of our larger units to see if we gained the same results.
The initial solution solved the problem for now, yet I see this as an ever evolving project, so I'll continually evaluate the formula.
Yes, initial solution was to split the business between the two vendors and to move our largest customer to the new vendor given their existing relationship with our customer. While it will allow us to diversify it will also give us better costing on one of our larges P&L line items.
Not really. He never came to talk to me in person or asked further questions relating to the accommodations in question. I turned back to the director and submitted all correspondence with the problem student, then gave a brief narrative relating to how I had indeed already accommodated the student. I have heard nothing further on the topic... as of yet.
Well the employee left upset but there wasn't any other avenue because I wasn't going to force a director into running their program in accordance with someone else purview.
Yes
Yes
It solved the problem in that I was able to test the geologic concept.
No.. because I treated everybody the same. The next solution has had tremendous results because I now treat people based on their individual personalities.
yes
The initial solution solved it. This past Friday we received a message back from the client saying "Thank you sir, I will be recommending you as much as I can. Great service and great execution." This makes us feel like we did make the right choice keeping it in-house. Now we can also let future potential clients know that we have experience in valuing this type of business.
No. The initial solution is time consuming and would take too long each month. I then turned to the account manager to ask about taking the exempt items to another G/L line so that I could say the difference between what we collected and what we paid were the exempt items and they could easily be identified.

Yes. It did for the most part. I still had to use a search engine (google) to search on how to do certain things that better integrated MS tools with the online environment and made the tool function as a information management system with dashboard capabilities.
Question 6 - Since this work-related problem was novel (new), did you share your findings? If so, with whom did you share your findings. What communications tools did you use to share your findings?
Shared findings, not so much, we are working on this, trying to develop a white paper, discuss with some customers, etc...
Absolutely. Announcement was made through the typical communication vehicles (e.g. email and online newsletter) and subsequently, recognized in town hall meetings and quarterly forums
Yes, with upper management, finance team and internal auditors via reports, Memo, and emails
Not yet
no findings yet.
We shared our findings and followed the PROSCI change management model to communicate and make the change stick.
I did not share my findings because I am still monetizing that executive Ph.D. degree ;) Seriously, I didn't share my investigative process because I am a solo consultant. I would share how this solution worked for my particular application, but it might not be universal. Short answer, I did not share my findings.
We are a small company. We only shared our findings and actions with our executive staff and our board in our monthly meeting.
Just with my director. I will probably mention it to a couple of colleges with the situation arises. Further sharing will probably be in person, while the communication with my director was don face to face and email.
No
Yes, I shared my findings with the General Manager. I communicated verbally and followed up with an email to document the findings and decisions.
I shared it with others in the leadership of my organization, our legal counsel, and board members.
The problem was novel to me. I am not sure that it was novel for other oil and gas producers that sell prospects.
Yes.. I mentor many individuals on how to understand personality traits and proper ways to motivate and drive results of the company. I use seminars, meetings, online zoom trainings and personal coaching and mentor ship
no
We shared it across several members of our team via email and face-to-face communication. I think that our findings are that we put more customization into our work for this project since we didn't have prior experience and going the extra mile had positive results.
I had to share my findings with the field general manager, accounting manager, controller, and director of support.
I compared my dashboard to some buddies that had been developing similar dashboards for the past 18 months. I used skype and email to provide links to mine and "brag" it only took a few weeks to stand up. I detailed some of the steps to make that happen.
Question 7 - Finally, think about your professional development. List all of the tools, tips, or techniques you used to grow and develop professionally.
Well this list good go on for days, Six Sigma - Green/black Belt Lean Training Customer Negotiations Quality Auditor trainings Customer Sales Training Project Management, etc...
I was familiar with all the tools required for the development of our solution, which included HFM, Oracle, Access and even Excel. I think the biggest lesson for me and the rest of the team was understanding how financial transactions flew through our systems. In a large organization, the recording of these transactions follow different rules and understanding how to identify and capture such transactions is not quite transparent and becomes very complex.

Reading literature from the profession, participating in continuous professional education (CPE), attending professional conferences, taking classes from universities and colleges, networking with fellows in profession etc
Industry conferences, sharing ideas with colleagues.
in-person meetings, phone calls, so far. Will employ some marketing strategies (maybe A and B testing), video creation, and tools specific to developing a managing a crowdfunding campaign
Coursera classes on people data analytics Industry certifications such as PROSCi and Six Sigma/ Lean Other certifications such as Design Thinking through Stanford and IDEO
Open communication. I solicit feedback from novices and experts because good ideas can come from inside and outside any field. When applicable, I share knowledge freely with others.
Formal education, mentoring (formal & informal) (mentor & mentee), work experiences, continued learning through reading, socializing.
Mostly done through observation of other professionals. Comparing and contrasting approaches displayed and discussed during professional development oriented presentations. Maybe a book or two on etiquette and professionalism.
Some tips i used where; try to “quickly” resolve issues in a timely manner, dont let the employee sit and wait for weeks. I referenced everything I speaking about so she also had reference for future questions.
Professional development courses, business literature and journals, seeking guidance from other professionals in the same industry.
I have found that practical experience has been the best teacher. It was difficult to learn how to be an independent oil and gas producer from a class or a book.
Many personal development classes, books on people, money, business and self improvement. Podcasts and YouTube videos have really made the learning curve quicker and personal mentors with those having more experience
Reflection of our decisions. Preparation and execution of development plans. 360 peer to peer evaluations.
I think that positioning ourselves up front was one of the things that paid off. More customization in the communication with the potential client as well as the product (report) resulting in good customer experience.
I take advantage of all training opportunities. I try to learn as much as I can and sit in on meetings that may further my training and ultimately my career. I am also working on becoming better at networking. I have also enrolled in a very expensive E. Ph.D program to help me grow professionally.
Several degrees (management, IT, Systems Engineering) and Six Sigma. I think six sigma has contributed most to my success and certainly was applicable with the metrics and charts I recommended for the dashboard. The systems engineering process and the six sigma define, measure, analyze, improve, control (DMAIC) processes provide several tools and techniques. FMEA, descriptive statistics, risk management matrix, etc. also help. I have completed several information technology college courses.

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